THE MARINER'S NEW CALENDAR.

CONTAINING

The Principles of ARITHMETIC and Practical GEOMETRY; with the Extraction of the SQUARE and CUBE-ROOTS: Alſo Rules for finding the PRIME, EPACT, MOON'S-AGE, Time of HIGH-WATER, with TABLES for the ſame.

TOGETHER WITH

Exact TABLES of the *Sun's Place*, *Declination*, and Right *Aſcenſion*. Of the Right *Aſcenſion* and *Declination* of the principal fixed *Stars*. Of the *Latitude* and *Longitude* of Places. A large TABLE of the Difference of *Latitude* and *Departure*, for the exact working a *Traverſe*.

ALSO

The DESCRIPTION and USE of the SEA-QUADRANT, FORE-STAFF, and NOCTURNAL: Neceſſary Problems in PLANE-SAILING and ASTRONOMY, wrought by the LOGARITHMS, and by GUNTER's SCALE. A TIDE-TABLE. The COURSES and DISTANCES on the Coaſt of GREAT-BRITAIN, IRELAND, FRANCE, &c. And the Soundings at coming into the Channel. With Directions for ſailing into ſome Principal Harbours.

By NATHANIEL COLSON, STUDENT in the MATHEMATICKS.

The whole reviſed and adjuſted to the NEW-STILE.

By WILLIAM MOUNTAINE. F. R. S.

⁂ To this EDITION is added, The *Compleat* IRISH *Coaſter*.

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To the Ingenious MARINER.

I Here preſent thee with a *New Calendar*, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practiſed) but to make Things plain and practicable: Here is nothing obſcure or difficult to diſcourage young Beginners (for whom it is intended) but all Things treated of with as much Plainneſs (both as to Matter and Method) as poſſible; and I aſſure thee, was I preſent to inſtruct thee, I could by no Means render Things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd Bigneſs of the Volume. The *Contents* are as follow:

The Principles of *Arithmetic*, with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted *Navigation* before they have underſtood ſomething of it; the *Extraction of the Square and Cube Roots*; In all which I have endeavoured to apply the Examples to Sea Affairs: Some neceſſary *Geometric Problems*, uſeful in *Navigation*; Directions for finding the *Prime*, *Epact*, *Moon's Age*, and the *Time of full Sea* (both according to the ordinary and a more accurate Way) with *Tables* for the ſame.

Tables of the Sun's Place and Declination, with Directions and Examples to every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of *London*, for which the ſaid Tables of Declination are calculated. A Table of the Sun's Right Aſcenſion. A Table of the Right Aſcenſion and Declination of ſome of the principal fixed Stars, with the Uſe of the ſaid Tables in finding the Time of a Star's coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the *Sea-Quadrant*, *Fore-Staff* and *Nocturnal*. A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt, collected from the beſt Information. Problems in *Plane-Sailing* and *Aſtronomy*, (which, that the Practitioner might learn two things at once) are wrought both by the *Logarithms* and *Gunter's*-Scale: A large and very uſeful Table of difference of *Latitude* and *Departure* to every Degree and Quarter Point of the Compaſs; with its Uſe in working a Traverſe in order to keep a Reckoning at Sea: A *Rutter* for the Coaſt of *Great Britain*, *France*, *Ireland*, *Spain*, *Portugal*, &c. Shewing the Bearing and Diſtance from one Place to another. A Table of the *Soundings* coming into the *Channel*, giving the Depth of Water, and Quality of the Ground. Laſtly, Directions for ſailing into ſome principal Harbours; by all, or any of which, if thou art by any Means profited (as I know thou mayeſt) if thou wanteſt Information in any of theſe Things, and doſt but carefully animadvert upon what thou readeſt, I have my End: And thy kind Acceptance hereof will further oblige

Thy ſincere Friend,

Nathaniel Colſon.

The Principles of Arithmetick briefly and plainly demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made; and firſt of Numeration.

Numeration.

NUmeration is that Part of *Arithmetick*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following:

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	*Two,*	*Three,*	*Four,*	*Five,*	*Six,*	*Seven,*	*Eight,*	*Nine,*	*Cypher.*

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may be plainly ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are ſet in; as 1 in the firſt Place, or Place of *Units*, is *One*; in the ſecond Place *Tens*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number:* As 123, which *Number* conſiſting of three Places, is thus numbered, *One Hundred Twenty-three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred and Twenty-three Thouſand, Four Hundred Fifty-ſix*; and this *Number* 123456789, conſiſting of nine Places, is thus numbered, *One Hundred Twenty-three Millions, Four Hundred Fifty-ſix Thouſand, Seven Hundred Eighty nine.*

ADdition is that which of ſeveral Sums makes but one Sum.

Example. Suppoſe four Men (A B.C.D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole. I begin at the firſt Row towards the Right Hand and ſay, 3 and 6 is 9, and 2 is 11, and 4 is 15; ſetting down the 5 under the Row added up: Then I carry the 1 Ten to the next Row, ſaying, 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; ſet down 9 under the Row added up, and carry 1 to the next Row, ſaying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which is 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13; which becauſe this is the laſt Row I ſet down. So that by this *Addition*, the whole Debt is found to be *Thirteen Thouſand, Nine Hundred, Ninety-five Pounds.*

	l.
A oweth	3564
B ——	5432
C ——	3156
D ——	1843
	13995

Characters uſed in Arithmetick.

l.	Pounds.
s.	Shillings.
d.	Pence.
°.	Degrees.
′.	Minutes.
″	Seconds.

Exam. 2. Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole.

Therefore begin again (as always in *Addition*) at the Right Hand, I ſay 11 and 10 is 21, and 4 is 25, and 6 is 31: Now conſidering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* wherefore I ſet down the odd 7*d.* under the Row of Pence, and carry the 2*s.* to the next Row being Shillings, ſaying, 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* ſet down 14*s.* and carry the 1*l* to the next Row, ſaying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; ſet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; ſet down 2 and carry 1; laſtly, 1 and 1 is 2: So that by this *Addition*, the whole Debt is, *Two Hundred Twenty and Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Exam. 3. Suppoſe at Sea, keeping my Reckoning in Degrees and Minutes, having ſix Days Difference of Longitude, I would know how much the whole is.

Say, 13 and 2 is 15, and 9 is 24, and 56 is 80, and 6 is 86; now 60 Minutes making a Degree, ſet down the odd 26 Minutes under the Row of Minutes, and carry 1 Degree to the next Row, being Degrees; ſaying, 1 that I carried, and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7; ſo that the whole Difference of Longitude made theſe 6 Days, is 7 Degrees and 26 Minutes.

	°	′
1 Day	1	06
2 ——	0	56
3 ——	1	09
4 ——	2	00
5 ——	1	02
6 ——	1	13
	7	26

Subtraction.

Subtraction is the taking of a leſſer Number out of a greater, to find the Remainder.

	li.	s.	d.
Example. Suppoſe a Man oweth me — —	376	13	06
And hath paid me — — —	211	05	08
I deſire to know what remains unpaid, which is —	165	07	10

To work this, I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 12, I go to the next Row, and ſay, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3 there remains 1: So there remains due of the ſaid Debt, *One Hundred Sixty-five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppoſe the Diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to ſail.

Therefore placing 396 under the 1000, I ſay, 6 from 0 I cannot, but 6 from 10, there remains 4: Proceeding to the next Figure, I ſay, 1 that I borrowed and 9 is 10; from 0 I cannot, but 10 from 10 there remains 0; again, 1 that I borrowed and 3 is 4, from 0 I cannot, but 4 from 10 there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0. So there remains 604 Miles.

Miles.
1000
396
604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32 there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11 there remains 9; then 1 that I borrowed and 4 is 5, from 5 there remains 0. So the Difference of Latitude is 9 Deg. 22 Min.

°	′
51	32
42	10
09	22

Multiplication.

Multiplication is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater; as the multiplying any Number of Pounds by 20 (the Number of Shillings contained in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of three Parts.

1. The *Multiplicand*, or Number to be multiplied.
2 The *Multiplier*, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the Table, which is firſt to be committed to Memory.

The

The Multiplication Table.

2 times	2	is	4
	3		6
	4		8
	5		10
	6		12
	7		14
	8		16
	9		18
3 times	3	is	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27
4 times	4	is	16
	5		20
	6		24
	7		28
	8		32
	9		36
5 times	5	is	25
	6		30
	7		35
	8		40
	9		45
6 times	6	is	36
	7		42
	8		48
	9		54
7 times	7	is	49
	8		56
	9		63
8 times	8	is	64
	9		72
9 times	9	is	81
10 times	10	is	100

Example. 1. I demand how many Shillings there are in 5648*l.* To anſwer this, multiply the given Number of Pounds by 20, thus: The firſt being 0 Cypher, ſet down 0 underneath the firſt Figure, and then proceed to the next Figure, and ſay, 2 times 8 is 16; ſet down 6 under the ſecond Figure, and carry 1; then, 2 Times 4 is 8, and 1 that I carried, makes 9; then 2 Times 6 is 12, ſet down 2, and carry 1; laſtly, 2 Times 5 is 10, and 1 that I carried makes 11. So that 5648*l.* multiplied by 20, make 112960 Shillings.

5648
20
112960

Example 2. In 276 Degrees how many Minutes?

Firſt ſet down — — — — 276
Then (becauſe 60 Minutes make a Degree) multiply by — — 60
The Product is — — — 16560

So that I find 276 Deg. multiplied by 60, make 16560 Minutes.

Example 3. Multiply — 8765437
By — — — 32
17530874
26296311
Product ——— 280493984

Multiply — 47632867
By — 4352
95265734
238164335
142898601
190531468
Product 207298237184

Diviſion.

Diviſion is that which ſerves in the Room of many *Subtractions*, and is uſeful in reducing all Numbers of a leſſer Denomination into a greater; as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, (*viz.*) *Dividend*, or the

Number to be divided, Diviſor, or the Number to divide by; and the Quotient; alſo if any Number remain it is called the Remainder.

Diviſor.	*Dividend.*	*Quotient.*
23)	7834	(340
	69··	
	93	
	92	
	14 Remainder.	

Example 1. To divide 7834 by 23: firſt ſay, how many times 2 in 7; Or how often 23 in 78, the Anſwer will be 3 times, which place in the Quotient; then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying 3 times 3 is 9 and 3 times 2 is 6, and place theſe under the two firſt Figures of the Dividend, and draw a Line: ſubtracting 69 from 78 there reſts 9, which ſet underneath, and Place a point under 3, to ſhow that it is brought down; place it to the 9, then proceed, ſaying how many times 23 in 93, or how many times 2 in 9; which will be 4 times: Place 4 in the Quotient, by which multiply the Diviſor: again, placing the Product which is 92 under 93 and draw a Line, and ſubtract it therefrom, the Remainder 1 put under the Line, and ſet down 4 the laſt figure in the Dividend, putting a Point under it, and Place it to the remaining 1; then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſor.	*Dividend.*	*Quotient.*
6|0)	36|0	(6
	36	
	00	

Example 2. In 360 Minutes how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree; and becauſe the laſt figure of the Diviſor is a Cypher, I cut it off, and with it the laſt figure of the Dividend, which is here alſo a Cypher, and divide 36 by 6 (which is the ſame thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay, how many Times 6 in 36? The Anſwer is 6 times: which I Place in the Quotient, and proceed to multiply the Diviſor 6, by the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0, ſo that by this Work it appears that in 360 Minutes there are 6 Degrees juſt.

Example 3. A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's Share being equally divided.

Diviſor.	*Dividend.*	*Quotient.*		
253)	59875	(236		253
	506··			236
	927			1518
	759			759
	1685			506
	1518			167
	167 Remains		Proof	59875

Firſt, ſay how many Times 2 in 5? The Anſwer is two Times, which Place in the Quotient; then multiply the Diviſor 253 by 2, the Figure placed in the Quotient, ſaying 2 Times 3 is 6, 2 Times 5 is 10, ſet down 0, and carry 1; 2 Times 2 is 4, and 1 is 5; which ſet down under the 3 firſt figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92; then take down 7 making a Point underneath, and ſet it after 92 the Remainder; then ſay how often 2 in 9; Anſwer 4 Times (for 5 will prove too many.) Then multiply the *Diviſor* 253, as before, by 3, the figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the figures above, the Remainder will be 168, then take down 5, and point it as before, ſetting it after 168, the laſt Remainder: And again, aſk the Queſtion, how often 2 is contained in 12? Anſwer 6 Times; by which 6, when ſet in the Quotient, multiply the *Diviſor* 253; and the Product is 1518, which Place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more figures to bring down, the Work is finiſhed, each Man's ſhare being 236*l* and 167*l* over, which is to be divided among them; which may eaſily be done, by multiplying 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor*, by 236 the Quotient; then taking in 167 the Remainder, under the three laſt figures, the Product will make the ſame with the *Dividend*, as you ſee in the Operation.

The Rule of THREE

IS that, by which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſion is the Anſwer to the Queſtion.

Example 1. If in 24 Hours a Ship ſails 130 Miles: How many Miles will ſhe ſail with the ſame Gale in 192 Hours, or eight Days?

Hours Miles Hours
24———————130— — ——— 192
130
———
5760
192
———
24960

24) 24960(1040 Miles in 192 Hours
24
———
96
96
—
00

Here 24 is the firſt Number, 130 the ſecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960 by 24 the firſt Number, which gives in the Quotient 1040 Miles, which is the way the Ship will make in 192 Hours the Time propoſed.

Example 3. If one lb. of Tobacco coſt 6*d*. what will 112lb. coſt?

112
6
———
12) 672 (Pence or 56 Shillings)

Here the firſt Number being an Unit, which neither multiplies nor divides, it ſaves the Labour of Diviſion, and the anſwer is 672 *d.* (for the Anſwer will be of the ſame Name with the ſecond Number) which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 *lb.* as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards, How high is that Caſtle whoſe Shadow is 100 Foot?

Which Queſtion, for the more ready Solution, ſtate thus;

If 6 Foot (which is 2 Yards) give 9 Foot, what will 100 Foot give?

```
      9
   ------
   6)900(150 Foot.
     6..
     ---
     30
     30
     ---
     00
```

By the Operation it appears, the ſaid Caſtle muſt be 150 Foot high.

Example 4. If 564*l* 12*s.* 6*d.* is to be divided between 165 Men, how much is one Man's Share?

Firſt reduce it all into Shillings by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught by Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l.* 12*s.* 6*d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but here it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing. *The operation follows.*

```
   564l. 12s. 6d.
     20
   ------
   11292
      12
   ------
    22590
   11292
  -------
165)135510(821 Pence              12)821(68 Shillings equal
    1320..                           72.    to 3l. 8s. 5d.
    ------                           ----
     351                             101
     330                              96
    ------                           ----
      210                              5
      165
    ------
       45
```

Note, That in the *Rule of Three*, the firſt and third Numbers muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein: as in the foregoing Example, I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers I put the Denomination of Men firſt and laſt, and the Money in the midſt, to anſwer to that Part of the Rule, which requires the firſt and third Numbers to be both of one Name. The anſwer whereof in the preceding Queſtion, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68 *s.* and 5 *d.* or 3 *l.* 8 *s.* and 5 *d.* one Man's Share, as was required.

The next thing I ſhall briefly treat of, is *The Extraction of the Square and Cube Roots*, as alſo ſomewhat of their Uſe.

The Extraction of the Square-Root.

· ·
7056(84 Root
64

164)656 Diviſor
656

000

Example. TO extract the Square Root of 7056 proceed thus: Firſt point the given Numbers (that is, put a Prick over every other Figure, beginning at the firſt Figure at the Right-hand, and note by the way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Number; then proceed ſeeking the greateſt Square Number (which is a Number multiplied by it ſelf,) in the firſt Point towards the Left-hand (70) which is 64 conſtituted of 8 multiplied into it ſelf; for 8 times 8 is 64. The Root of the Square Number which is 8, Place in the Quotient, and ſubſcribe the Square Number (64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: to this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place it (*viz.* 16) therein, calling it the Diviſor. Seek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right hand, (*viz.*) How many times 16 in 64? The Anſwer is 4 times, which Place in the Quotient, and alſo on the Right-hand of the Diviſor (16); then multiply the Diviſor (164) by the 4 laſt placed in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom; which done, nothing remains. So that the Square Root of 7056 is 84.

The Square Root is applied to Navigation as follows.

Any two ſides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppoſe a Ship has made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required, the ſaid Diſtance is found by the Extraction of the Square Root, as follows.

The Rule. Square the Difference of Latitude and Departure ſeverally (that is, multiply each by it ſelf) and from the Sum of both the Squares added together, extract the Square Root, which will be the Diſtance required.

Example.

Difference of Lat. 87.	The Departure 71.	Square Diſt. Lat. —7569
Multiplied by itſelf 87.	Multip. by itſelf 71.	Square Departure —5041
609	71	Sum 12610
696	497	
The Square = 7569	The Square = 5041	

By the Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

12610(112 the Diſtance required.
1
21 (26
21
222(510
444
66

Example 2. Suppoſe a Ship's Diſtance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Diſtance —	111 —	The Departure	= 57
Multiplied by itſelf	111 —	multiplied by itſelf	= 57
	111		399
	111		285
	111	Square of Departure	= 3249
Square of the Diſtance	12321		
Square of the Dep. ſubtract	3249		
Remains	9072		

9072(95 Diff. Lat. required.
81
185(972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Diſtance, ſubtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation, for Brevity ſake, is omitted.

Having proceeded thus far in ſhewing the *Practitioner* how to find the Diſtance, Difference of Latitude and Departure (any two of them being given) without *Trigonometry*, I ſhall ſhew the manner of finding the Courſe (exact enough for common Uſe) without the ſaid Operation. Which is done as follows.

The Proportion to find the Courſe. As the Sum of the Hypotenuſe (or Diſtance) and Half the greater of the other two Legs *(viz.)* if the Difference of Latitude be moſt, half that, but if the Departure be moſt, half that; I ſay, as the Sum of theſe two is in Proportion to the leſſer (or remaining) Leg. ſo is 86 to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Compliment of the Courſe required.

Exam. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, add the Diſtance, and half the greater Leg, into one Sum.

The Diſtance is — — — 110
Half the greater Leg (88) is — — — 44
The Sum 154

Having thus done, ſay by the *Rule of Three,*

As the ſaid Sum 154 is to 66, the leſſer Leg, ſo is 86 to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60 (the Number of Minutes contained in a Degree) and divide the Product by the *Diviſor*, (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minutes: So that the Courſe required is 36 Deg. 51 Min.

66
516
516
154)5676(36 deg. 51 min.
462
1056
924
132

132
60
154)7920(51
770
220

Example 3. *Extraction of the Square Root.* Suppoſe a Rope of 5 Inches Compaſs, and another Rope of double the Strength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root*: For ſhould it be ſuppoſed that a Rope of ten Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe; for the ſaid Rope of 10 Inches is 4 Times the Strength of that of 5.

The Rule. Take the Compaſs of the given Rope (*viz.* 5.) and multiply that by itſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply by 2, and the Square Root of the Product is the Compaſs of the Rope required.

Example. The given Rope's Compaſs 5 Inches, extract the Root 50(7
Multiply by itſelf —— 5 49
The Square —— 25 1
Multiplied by —— — 2
50

So by the Operation it appears, that a Rope to be twice the Strength of the given Rope of 5 Inches Compaſs, muſt be 7 Inches and a little better.

If it's deſired to know the Weight of one Rope by another, 'tis as follows:

The Proportion is. As the Square of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the Weight of the one to the Weight of the other, Length for Length. *Exam.* Suppoſe a Cable of 10 Inches to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say, As 100 (the Square of 10) is to 64, the Square of 8; ſo is 25 C. the Weight of one Cable, to 16 C. the Weight of the other required.

Extraction of the Cube Root.

I Shall firſt, as neceſſary, inſert a Table of the Cubes of the nine Digits, which ought to be committed to Memory.

Cubes of the nine Digits.			
	1 —— 001	4 —— 064	7 —— 343
	2 —— 008	5 —— 125	8 —— 512
	3 —— 027	6 —— 216	9 —— 729

Example 1. Extract the Cube Root of 12167

. .
12167(23 Root
8
——
4167 Reſolvend
——
1200 Triple Square
60 Trip. Quot.
——
1260 Diviſor
——
3600
540
027
——
4167
——
000

Firſt, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right hand) then ſeek the greateſt Cube in the firſt Point (*viz.* 12) which is 8, the Cube Root whereof (which is 2) Place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend, then draw a Line underneath it, then ſquare the Quotient 2, which is 4; multiply the ſaid Square (4) by 300, which makes 1200; Place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two (*viz.*) Triple Square and Triple Quotient, into one Sum, and call it the *Diviſor*; ſeek how often this *Diviſor* is contained in the Reſolvend, which is three times; which three placed in the Quotient, multiply the Triple Square by the Figure 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the *Diviſor*; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and Place it underneath the laſt Product; Cube the Figure (3) laſt placed in the Quotient, and Place it under the preceding Product. Laſtly, add theſe three Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder, had there been any more Figures, the next Point muſt have been brought down, and the preceding Work repeated from the ſquaring of the Quotient, until all the Figures are ſo brought down: But in this Example, there being no more Figures, the Work is done, and by the Operation, the Cube Root of 12167, appears to be 23, nothing remaining.

Example 2. *Applied.* Suppoſe a Ship of 300 Tun 75 Foot by the Keel, 29 Foot and a Half at the Beam, and 14 Foot deep in the Hold; and another Ship is deſired of the ſame Mould and Shape of 500 Ton, the ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. Firſt, Cube the Length of the given Keel, which is done by multiplying it into it ſelf, and then multiplying the Product by it again.

Then ſay by the Rule of Three; as 300 Tons the one Ship's Burthen; to 500 Tun the other Ship's Burthen; ſo is 421875 the Cube of the one Ship's Keel's Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the ſame as if there had been more Figures in the propoſed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ parts.

Thus having found one of the Dimenſions, the reſt may be found without the Extraction of the Root by the Rule of Three.

Thus, Suppoſe the next thing I would find be her Breadth by the Beam, ſay, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*. So $29\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which, by the Rule of Three, gives 35 Foot.

So you may find the Depth in the Hold, &c.

Example 3. Suppoſe an Iron Shot 4 Inches Diameter to weigh 9lb. required the Diameter of a Shot of any other Weight, ſuppoſe of 72lb. This is alſo done by the Extraction of the Cube Root as follows:

Firſt, ſay, by the Rule of Three,

As 9lb. the weight of one Shot, to 72lb. the weight of the other; ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter; which by the Operation is 512 the Cube Root of which is 8, the Diameter of the Shot required.

```
     75 given Keel
     75
     —
    375
   525
   ————
   5625
     75
  ——————
  28125
 39375
 ——————
421875 Cube given Keel
  .  .
 703125 (88 9/10 Root
 512
 ——————
 191125 Reſolvend
 ——————
   19200 Triple Square
     240 Triple Quotient
  ———————
   19440 Diviſor
 153600
  15360
     512
 ———————
 169472
  21653000 Reſolvend
  ————————
  2323200 Trip. Square
     2640 Tr. Quotient
  ————————
  2325840 Diviſor
  ————————
  20908800
    213840
       729
  ————————
  21123369
  ————————
     52963 Remainder.
```

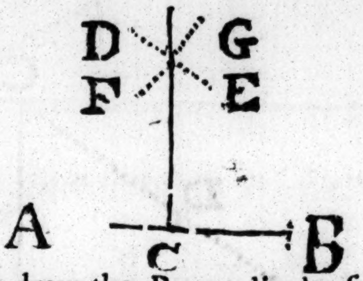
But if it were required to find the Weight of a Shot by the Diameter, it is done thus, by the Rule of Three.

As the Cube of the one Shot's Diameter is to the Cube of the other; ſo is the Weight of the one Shot, to the Weight of the other required.

And thus much for the Arithmetical Part of this Treatiſe.

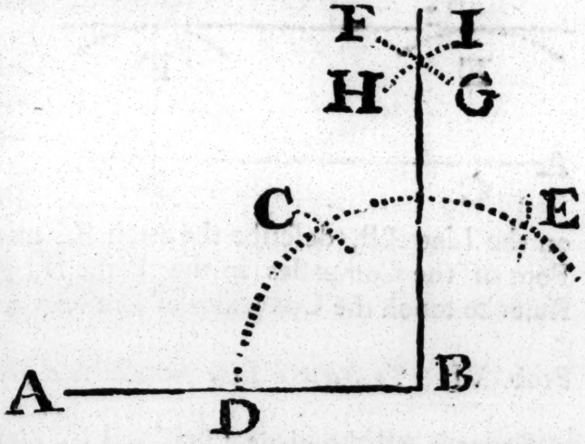
Prob.

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*



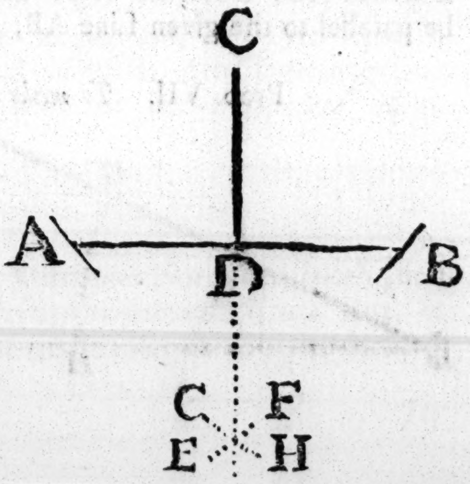
LET the Line given be AB, and the Perpendicular to be raiſed from the Point C; to do which, ſet off the two equal Diſtances, CA and CB, then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch DE: then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, through the Interſection (or Cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*



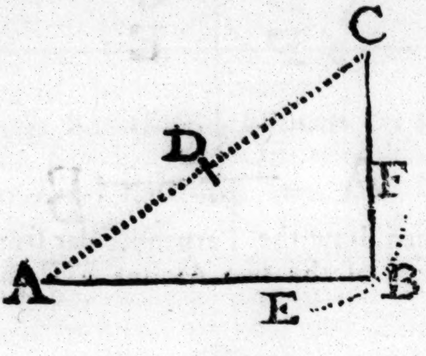
Let the Line given be AB, the Perpendicular to be raiſed from the Point B; to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E; then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch FG; and placing the Compaſſes in the Point E, deſcribe the Arch HI; then from the Point B, and through the Interſection of the two Arches FG and HI, draw the Perpendicular, which was required.

Prob. III. *To let fall a Perpendicular from a Point aſſigned, over a given Right Line.*



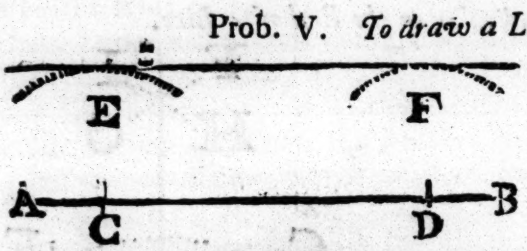
Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compaſſes in the Point C; then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch CH; then from the Point C, and by the Interſection of the ſaid two Arches, draw the Perpendicular CD, which was required.

Prob. IV. *Another Way to let fall a Perpendicular from a given Point, on a given Right Line.*



Let the Line given be AB, upon which let it be required to let fall a Perpendicular from the Point C; to do which, from the Point aſſigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D, then one Point of the Compaſſes reſting in the Point D, with the ſame Diſtance (*viz.* of half the Line AC) deſcribe the Arch EF; then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

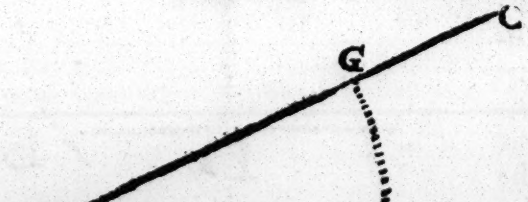
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel; to do which, firſt take in the Compaſſes the Diſtance at which the Parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame Diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the Parallel Line FE.

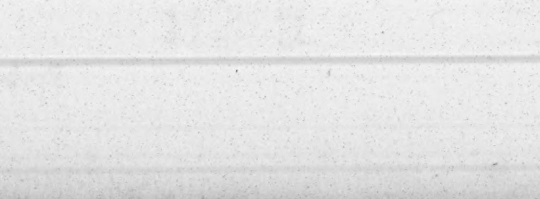
Prob. VI. *To draw a Line parallel to a given one, that ſhall paſs through a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line parallel thereto, that ſhall paſs through a given Point, as C.

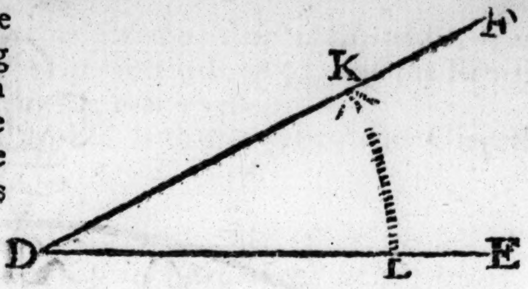


Set one Foot of the Compaſſes in C, with the other at any Diſtance croſs AB in D, and with that Diſtance from any Point, as A, of the Line AB, deſcribe an Arch EF; then from C, with the Distance AD, croſs the Arch EF in G, and draw the Line CG, which will be parallel to the given Line AB, as was required.

Prob. VII. *To make an Angle equal to any Angle given.*

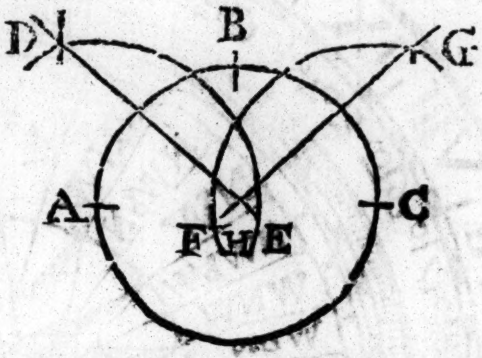


Suppoſe ABC an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line DE, then with any convenient Diſtance leſs than AB, deſcribe the Arch GH, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the



Arch GH ſweep the Arch KL; take the Arch GH in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle BAC, as was required.

Prob. VIII. *To bring any three Points not ſituate in a Right Line, into the Circumference of a Circle.*



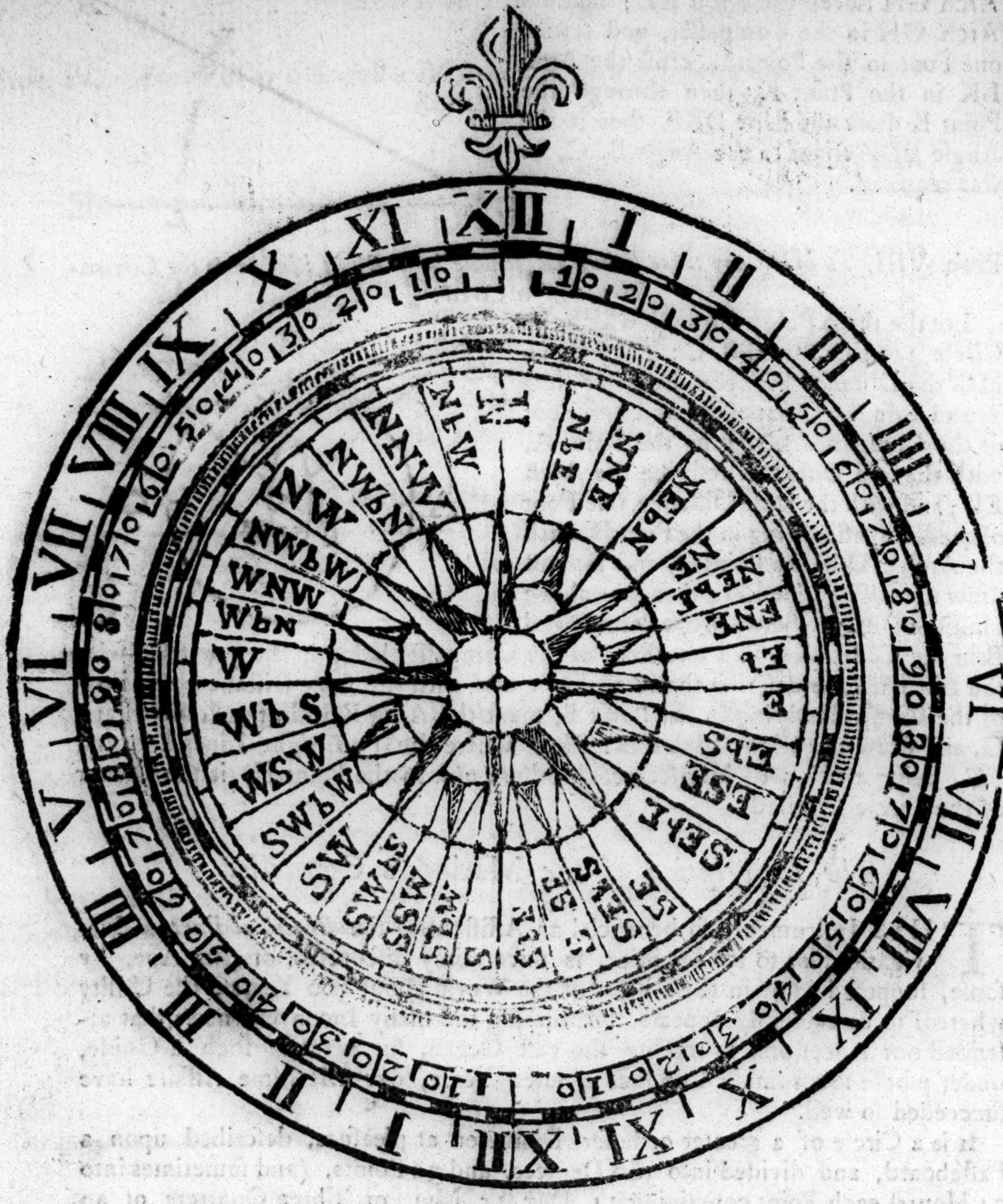
Let the three Points through which the Circle is to paſs, be A, B, C: Take above Half the Diſtance between the two Points A and B in the Compaſſes: and one Foot of the Compaſſes being in the Point A, with the ſaid Diſtance deſcribe the Arch ED; and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch ED in the Points E and D, and draw the Right Line ED; then take above Half the Diſtance between the Point C and B in the Compaſſes, and one Foot of the Compaſſes being in the Point C, with the ſaid Diſtance deſcribe the Arch FG: and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG: Now where the two Right Lines DE and FG, being continued, interſect each other (*viz.* in the Point H) is the Center of the Circle required.

The Deſcription of the Mariner's Compaſs.

THIS Inſtrument, ſo beneficial an Aſſiſtant to the *Practical Part* of Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome, ſuppoſed to be in theſe Parts of the World about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniencies that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of a greater or leſſer Diameter at pleaſure, deſcribed upon a Paſteboard, and divided into 360 Degrees, and 32 Points, (and ſometimes into 24 Hours) each Point containing 11 Deg. 15 Min. or Three Quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Card or Paſte-board, there are paſted on the other Side of the ſaid Card or Paſte-board, two Wires, which Wires being touched with a Loadſtone, and the Card hung at the Center upon a Pin, fixed in a Box, its Poſition (Variation excepted) becomes North and South; and the ſaid Box being covered with a Glaſs, is hung in another ſquare Box, in ſuch Manner, that the Card may traverſe, notwithſtanding the Ship's Motion: And being thus fixed, it is ready for Uſe.



To find the Prime or Golden Number.

THE *Prime* or *Golden Number*, is a Revolution of nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the *Prime* or *Golden Number*; but if nothing remains, the *Prime* is 19.

Example. To find the Golden Number for the Year 1758, add 1, which makes 1759; which divided by 19, the Quotient will be 92, and the Remainder 15, which is the Golden Number for the Year 1758.

N. B. The Golden Number is the ſame in both the Julian and Gregorian Account of time.

To find the Epact.

THE Epact is the Number of Days which the Solar Year, conſiſting of 365 Days, exceeds the Lunar (or twelve Revolutions of the Moon to the Sun) containing 354 Days, the Difference being 11 Days. When the Prime is 1, the Epact is 0; when 2, the Epact is 11; when 3, twice 11, or 22; when 4, thrice 11, or 33, or 3, omitting 30, (which muſt conſtantly be done when it exceeds 30;) and may be found in the following Manner.

Subtract 1 from the Prime, Multiply the remainder by 11, and Divide that Product (if it exceed 30) by 30; the Remainder will be the Epact.

Example. Suppoſe it were required to find the Epact for the Year 1758.

The Prime for the Year 1758 is — — —	11
From which ſubtract — — — — —	1
The Remainder is — — — — —	10
Which Multiplied by — — — —	11
The Product is — — — —	110

This Product being divided by 30, the Quotient will be 3, and the Remainder 20, which is the Epact required.

Note. After the Year 1799, there will require a different Method to find the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: Theſe three Sums added together, if leſs than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the Day of the Change. Again 15 added to, or ſubtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppoſe it were required to find the Moon's Age for the firſt Day of *April*, 1762.

Firſt, ſet down the Epact for that Year — — —	4
To which add the Number for the Month, which is — —	2
To that add the day of the Month, which is — —	1
Sum gives the Moon's Age —	7

Then out of—30
Take ———7 The Moon's Age.
Remains — 23 Days to next Change.
Subtract — 15
Makes —— 8 Days to next full Moon.

To

1761
19
15=9
15
150

To find the Moon's Southing, and Time of Full-Sea, or High-Water: The Reader is here referr'd to the Tide Table, Page 28, *&c.* and the Uſe thereof immediately following.

To find the Dominical Letter.

DIvide the Year and its fourth Part by 7, the Remainder ſubtracted from 7 gives the Dominical Letter; reckoning A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe it was required to find the Dominical Letter for the Year 1758.

Firſt, Set down the Year — — — — 1758
Then the 4th Part, (the Remainder 2 omitted, which denominates it to be the Second Year after Leap Year,) is — — 439
The Sum is — — — — — 2197

This Sum being divided by 7, the Quotient will be 313, and the Remainder 6, which being ſubtracted from 7, leaves 1; and conſequently the Dominical Letter is A: But when it is Leap-Year, there will be two Dominical Letters, and then the Letter thus found ſerves from the laſt of *February* to the end of the Year; and the Letter beſore that, reckoning them backwards from G, is the Sunday Letter for the former Part of the Year, to that Time.

N. B. After the Year 1799, The Order of the Dominical Letters, as they now range, will be diſturbed and conſequently to find them, another Method muſt then take Place.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year — 1758
Then add — — — 9
Divided by — — 28)1767(63
168
87
84
3

By the Operation it appears that 3 is the Cycle of the Sun for the Year 1758, being the Remainder after the Diviſion.

Note, *Hillary* Term begins *Jan.* 23, and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter Day*, and ends *Monday* before *Whitſunday.*

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends nineteen Days after.

Michaelmas Term begins *November* 6, and ends *November* 28.

A Table of the Moon's Age for the Year 1774.

Months		D.	H.
January	Laſt quart.	5	5 A
	New moon	12	8 M
	Firſt quart.	19	3 A
	Full moon	27	6 A
February	Laſt quart.	4	2 M
	New moon	10	8 A
	Firſt quart.	18	noon
	Full moon	26	10 M
March	Laſt quart.	5	9 M
	New moon	12	9 M
	Firſt quart.	20	8 M
	Full moon	28	1 M
April	Laſt quart.	3	5 A
	New moon	10	midn
	Firſt quart.	18	midn
	Full moon	26	8 M
May	Laſt quart.	3	1 M
	New moon	10	3 A
	Firſt quart.	18	6 A
	Full moon	25	4 A
June	Laſt quart.	1	8 M
	New moon	9	6 M
	Firſt quart.	17	7 M
	Full moon	23	midn
	Laſt quart.	30	7 A
July	New moon	8	9 A
	Firſt quart.	16	4 A
	Full moon	23	6 M
	Laſt quart.	30	8 M
Auguſt	New moon	7	11 M
	Firſt quart.	14	11 A
	Full moon	21	3 A
	Laſt quart.	29	1 M
September	New moon	6	2 M
	Firſt quart.	13	5 M
	Full moon	20	1 M
	Laſt quart.	27	8 A
October	New moon	5	3 A
	Firſt quart.	12	noon
	Full moon	19	2 A
	Laſt quart.	27	2 A
November	New moon	4	2 M
	Firſt quart.	10	7 A
	Full moon	18	6 M
	Laſt quart.	26	10 M
December	New moon	3	11 M
	Firſt quart.	10	9 M
	Full moon	17	midn
	Laſt quart.	26	4 M

There will be two Eclipſes this Year, and both of the Sun.

The firſt is on *March* the 12th, viſible in *Africa*.
The ſecond is on *September* the 6th, viſible in *China* and the *Eaſt-Indies*.

A Table of the Moon's Age for the Year 1775.

Months		D.	H.
January	New moon	1	11 A
	Firſt quart.	8	11 A
	Full moon	16	8 A
	Laſt quart.	24	2 A
	New moon	31	noon
Febru.	Firſt quart.	7	3 A
	Full moon	15	2 A
	Laſt quart.	23	2 M
March	New moon	1	9 A
	Firſt quart.	9	7 M
	Full moon	17	7 M
	Laſt quart.	24	2 A
	New moon	31	2 A
April	Firſt quart.	7	midn
	Full moon	15	9 A
	Laſt quart.	22	8 A
	New moon	30	3 M
May	Firſt quart.	7	6 A
	Full moon	15	9 M
	Laſt quart.	22	2 M
	New moon	29	3 A
June	Firſt quart.	6	6 M
	Full moon	13	5 A
	Laſt quart.	20	11 M
	New moon	28	4 M

Months		D.	H.
July	Firſt quart.	5	9 A
	Full Moon	13	1 M
	Laſt quart.	19	8 A
	New moon	27	5 A
Auguſt	Firſt quart.	4	9 M
	Full moon	11	6 M
	Laſt quart.	18	8 M
	New moon	26	6 M
September	Firſt quart.	2	8 A
	Full moon	9	5 A
	Laſt quart.	16	6 A
	New moon	24	8 A
October	Firſt quart.	2	6 M
	Full moon	9	1 M
	Laſt quart.	16	2 A
	New moon	24	7 M
	Laſt quart.	31	2 A
November	Full moon	7	noon
	Laſt quart.	15	7 M
	New moon	22	8 A
	Firſt quart.	30	1 M
December	Full moon	7	3 M
	Laſt quart.	15	2 M
	New moon	22	9 M
	Firſt quart.	29	10 M

There will be four Eclipſes this Year, two of the Sun, and two of the Moon.

The firſt is of the Moon, *February* the 15th, inviſible.
The ſecond is of the Sun, *March* the 1ſt, inviſible.
The third is of the Moon, *Auguſt* the 11th, inviſible.
The fourth is of the Sun, *Auguſt* the 26th, inviſible.

A Table of the Moon's Age for the Year 1776

Months		D.	H.	Months		D.	H.
January	Full moon	4	7 A	*July*	Laſt quart.	8	9 M
	Laſt quart.	13	11 A		New moon	15	4 A
	New moon	21	2 M		Firſt quart.	23	6 A
	Firſt quart.	27	5 A		Full moon	30	12 A
February	Full moon	4	1 A	*Auguſt*	Laſt quart.	6	3 A
	Laſt quart.	12	4 A		New moon	14	6 M
	New moon	19	1 A		Firſt quart.	22	9 M
	Firſt quart.	26	6 M		Full moon	29	6 M
March	Full moon	5	8 M	*September*	Laſt quart.	4	11 A
	Laſt quart.	13	6 M		New moon	12	10 A
	New moon	19	9 A		Firſt quart.	20	11 A
	Firſt quart.	26	9 A		Full moon	27	4 A
April	Full moon	4	1 M	*October*	Laſt quart.	4	1 A
	Laſt quart.	11	4 A		New moon	12	4 A
	New moon	18	7 M		Firſt quart.	20	10 M
	Firſt quart.	25	2 A		Full moon	27	1 M
May	Full moon	3	4 A	*November*	Laſt quart.	3	5 M
	Laſt quart.	10	12nt.		New moon	11	9 M
	New moon	17	4 A		Firſt quart.	18	8 A
	Firſt quart.	25	8 M		Full moon	25	midn
June	Full moon	2	5 M				
	Laſt qnart.	9	4 M	*December*	Laſt quart.	2	12 A
	New moon	15	11 A		New moon	11	1 A
	Firſt quart.	24	1 M		Firſt quart.	18	4 M
	Full moon	31	4 A		Full moon	25	1 M

Four Eclipſes this Year, two of each Luminary.

The firſt of the Moon, *February* the 4th, total, but inviſible here.
The ſecond of the Sun, *February* the 19th, inviſible.
The third of the Sun, *July* the 15th, inviſible.
The fourth of the Moon, *July* the 30th, at Midnight, viſible.

A Table of the Moon's Age for the Year 1777.

Months		D.	H.
January	Laſt quart.	1	8 A
	New moon	9	3 A
	Firſt quart.	16	11 M
	Full moon	23	3 A
	Laſt quart.	31	5 A
Febr.	New moon	8	3 M
	Firſt quart.	14	7 A
	Full moon	22	8 M
March	Laſt quart.	2	noon
	New moon	9	2 A
	Firſt quart.	16	5 M
	Full moon	24	1 M
April	Laſt quart.	1	4 M
	New moon	7	11 A
	Firſt quart.	14	5 A
	Full moon	22	6 A
	Laſt quart.	30	4 A
May	New moon	7	7 M
	Firſt quart.	14	7 M
	Full moon	22	10 M
	Laſt quart.	30	1 M
June	New moon	5	3 A
	Firſt quart.	12	10 A
	Full moon	21	1 M
	Laſt quart.	28	7 M
July	New moon	4	midn
	Firſt quart.	12	3 A
	Full moon	20	1 A
	Laſt quart.	27	11 M
Auguſt	New moon	3	11 M
	Firſt quart.	11	9 M
	Full moon	18	11 A
	Laſt quart.	25	4 A
September	New moon	1	midn
	Firſt quart.	10	3 M
	Full moon	17	9 M
	Laſt quart.	23	11 A
October	New moon	1	4 A
	Firſt quart.	9	7 A
	Full moon	16	noon
	Laſt quart.	23	10 M
	New moon	31	9 M
November	Firſt quart.	8	10 M
	Full moon	15	3 M
	Laſt quart.	21	midn
	New moon	30	4 M
December	Firſt quart,	7	10 A
	Full moon	14	1 A
	Laſt quart.	21	5 A
	New moon	29	9 A

There are four Eclipſes this Year, three of the Sun, and one of the Moon.

The firſt of the Sun, *January* the 9th, Part viſible.
The ſecond of the Moon, *January* 23d, Part viſible
The third of the Sun, *July* the 4th, inviſible.
The fourth of the Sun, *December* 29th, inviſible.

A Table of the Moon's Age for the Year 1778.

Months		D.	H.
January	Firſt quart.	6	9M
	Full moon	12	midn
	Laſt quart.	20	1 A
	New moon	28	1 A
February	Firſt quart.	4	4 A
	Full moon	11	1 A
	Laſt quart.	19	9M
	New moon	27	3M
March	Firſt quart.	5	11 A
	Full moon	13	4M
	Laſt quart.	21	5M
	New moon	28	3 A
April	Firſt quart.	4	6M
	Full moon	11	7 A
	Laſt quart.	19	11 A
	New moon	27	1M
May	Firſt quart.	3	3 A
	Full moon	11	11M
	Laſt quart.	19	2 A
	New moon	26	8M
June	Firſt quart.	2	2M
	Full moon	10	3M
	Laſt quart.	18	1M
	New moon	24	3 A
July	Firſt quart.	1	3 A
	Full moon	9	7 A
	Laſt quart.	16	8M
	New moon	23	11 A
	Firſt quart.	31	6M
Auguſt	Full moon	8	9M
	Laſt quart.	15	2 A
	New moon	22	8M
	Firſt quart.	29	midn
September	Full moon	6	9 A
	Laſt quart.	13	7 A
	New moon	20	8 A
	Firſt quart.	28	7 A
October	Full moon	6	8M
	Laſt quart.	13	1M
	New moon	20	10M
	Firſt quart.	28	2 A
November	Full moon	4	7 A
	Laſt quart.	11	10M
	New moon	19	3M
	Firſt quart.	27	7M
December	Full moon	4	6M
	Laſt quart.	10	10 A
	New moon	18	10 A
	Firſt quart.	26	10 A

There will be four Eclipſes this Year, two of each Luminary.

The firſt is of the Moon, *June* the 10th, morning, ſcarce viſible.
The ſecond is of the Sun, *June* the 24th, at 3 Afternoon, viſible.
The third is of the Moon, *December* the 4th, in the Morning, viſible.
The fourth is of the Sun, *December* 18th, at 10 Afternoon, inviſible in *Europe*.

A Table of the Moon's Age for the Year 1779.

Months		D.	H.
January	Full moon	2	3 A
	Laſt quart.	9	1 A
	New moon	17	4 A
	Firſt quart.	25	11 M
Febru.	Full moon	1	2 M
	Laſt quart.	8	7 M
	New moon	16	10 M
	Firſt quart.	23	9 A
March	Full moon	2	1 A
	Laſt quart.	10	1 M
	New moon	18	2 M
	Firſt quart.	25	4 M
April	Full moon	1	1 M
	Laſt quart.	8	9 A
	New moon	16	2 A
	Firſt quart.	23	9 M
	Full moon	30	10 M
May	Laſt quart.	8	3 A
	New moon	16	1 M
	Firſt quart.	22	3 A
	Full moon	30	4 M
June	Laſt quart.	7	8 M
	New moon	14	9 M
	Firſt quart.	20	11 A
	Full moon	28	7 A

Months		D.	H.
July	Laſt quart.	6	9 A
	New moon	13	3 A
	Firſt quart.	20	9 M
	Full Moon	28	11 M
Auguſt	Laſt quart.	5	8 M
	New moon	11	11 A
	Firſt quart.	18	11 A
	Full moon	27	3 M
September	Laſt quart.	3	4 A
	New moon	20	7 M
	Firſt quart.	17	3 A
	Full moon	25	6 A
October	Laſt quart.	2	10 M
	New moon	9	6 A
	Firſt quart.	17	10 M
	Full moon	25	7 M
November	Laſt quart.	1	6 M
	New moon	8	7 M
	Firſt quart.	16	7 M
	Full moon	23	8 A
	Laſt quart.	30	1 A
December	New moon	7	10 A
	Firſt quart.	16	2 M
	Full moon	23	7 M
	Laſt quart.	29	11 A

There are ſix Eclipſes this Year, four of the Sun, and two of the Moon.

The firſt of the Sun, *May* the 16th, inviſible in *Europe*.

The ſecond of the Moon, *May* 30th, total, but moſtly inviſible.

The third of the Sun, *June* 14th, at 9 Morning, viſible and partial.

The fourth of the Sun, *November* 8th, inviſible.

Fifth of the Moon, *November* 23d, in the Evening, viſible and total.

Sixth of the Sun, *December* 7th, inviſible in our Hemiſphere.

A Table of the Moon's Age for the Year 1780.

Months		D.	H.
January	New moon	6	4 A
	Firſt quart.	13	7 A
	Full moon	21	6 A
	Laſt quart.	28	10 M
February	New moon	5	10 M
	Firſt quart.	13	11 M
	Full moon	20	1 M
	Laſt quart.	27	1 M
March	New moon	6	5 M
	Firſt quart.	13	10 A
	Full moon	20	1 A
	Laſt quart.	27	6 A
April	New moon	4	10 A
	Firſt quart.	12	7 M
	Full moon	18	midn
	Laſt quart.	26	noon
May	New moon	4	noon
	Firſt quart.	11	1 A
	Full moon	18	10 M
	Laſt quart.	26	7 M
June	New moon	2	11 A
	Firſt quart.	9	5 A
	Full moon	16	10 A
	Laſt quart.	24	noon

Months		D.	H.
July	New moon	2	8 M
	Firſt quart.	8	11 A
	Full moon	16	noon
	Laſt quart.	24	3 A
	New moon	31	4 A
Auguſt	Firſt quart.	7	7 M
	Full moon	15	3 M
	Laſt quart.	23	5 M
	New moon	29	11 A
September	Firſt quart.	5	6 A
	Full moon	12	8 A
	Laſt quart.	21	5 A
	New moon	28	8 M
October	Firſt quart.	5	9 M
	Full moon	13	1 A
	Laſt quart.	21	4 M
	New moon	27	5 A
November	Firſt quart.	4	2 M
	Full moon	12	5 M
	Laſt quart.	19	10 M
	New moon	26	5 M
December	Firſt quart.	3	11 A
	Full moon	11	7 A
	Laſt quart.	18	5 A
	New moon	25	7 A

There will be four Eclipſes this Year, two of each Luminary.

The firſt of the Sun, *May* the 4th, at 1 Afternoon, inviſible.
The ſecond of the Moon, *May* the 17th, at 11 Morning, inviſible.
The third of the Sun, *October* the 23d, at 4 Afternoon, inviſible.
The fourth of the Moon, *November* 12th, at 4 Morn. viſible 7 Digits.

Months		D.	H.
January	Firſt quart.	1	7 A
	Full moon	10	9M
	Laſt quart.	17	1 M
	New moon	24	11 M
Febr.	Firſt quart.	1	4 A
	Full moon	8	8 A
	Laſt quart.	15	11 M
	New moon	23	5 M
March	Firſt quart.	3	8M
	Full moon	10	6M
	Laſt quart.	16	10 A
	New moon	24	11 A
April	Firſt quart.	1	11 A
	Full moon	8	3 A
	Laſt quart.	15	1 A
	New moon	23	4 A
May	Firſt quart.	1	9M
	Full moon	7	11 A
	Laſt quart.	15	4M
	New moon	23	7M
	Firſt quart.	30	4 A
June	Full moon	6	8M
	Laſt quart.	13	9 A
	New moon	21	8 A
	Firſt quart.	28	9 A
July	Full moon	5	6 A
	Laſt quart.	13	2 A
	New moon	21	6M
	Firſt quart.	27	midn
Auguſt	Full moon	4	6M
	Laſt quart.	12	8M
	New moon	19	4 A
	Firſt quart.	26	6M
September	Full moon	2	8 A
	Laſt quart.	10	midn
	New moon	18	1M
	Firſt quart.	24	4 A
October	Full moon	2	1 A
	Laſt quart.	10	3 A
	New moon	17	9M
	Firſt quart.	24	4M
November	Full moon	1	7M
	Laſt quart,	9	4M
	New moon	15	7 A
	Firſt quart.	22	8 A
December	Full moon	1	1M
	Laſt quart.	8	2 A
	New moon	15	6M
	Firſt quart,	22	3 A
	Full moon	30	5 A

There will be two Eclipſes this Year, and both of the Sun.

The firſt is on *April* the 23d, near Sun-ſet, viſible, tho' ſmall.
The ſecond is on *October* the 17th, at 9 in the Morning, ſcarce viſible.

The Uſe of the foregoing Tables of the Moon's Age.

IN the ſaid Table the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months: in the firſt Column of each half, towards the Left-hand are the Months; in the ſecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the ſaid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A ſignifying Afternoon, M Morning. At the Bottom of each Table are the Eclipſes for that reſpective Year.

The Uſe of the Tables is, readily by Inſpection, to find the Day and Hour of the New, Full, or Quarters of the Moon.

Example 1. Suppoſe it was deſired to find the Time of New Moon, *January*, 1764. Firſt look for the Year 1764 on the Top of the Leaf, which having found, look for *January* in the firſt Column towards the Left-hand; then in the next Column in the ſame month is found New Moon; and in the two following Columns againſt New Moon ſtands 3d. 10 h. M. which ſhews that the New Moon in *January* 1764 is the 3d Day at 10 o'Clock in the Morning. The ſame Directions ſerve for the full Moon, or firſt and laſt Quarter.

To find the Moon's Age ſubtract the Day of the Change or New Moon from the Day Propoſed, the Remainder is the Moon's Age. Suppoſe therefore it was required to find the Moon's Age for *December* 27, 1764.

Looking in the Year 1764, the Table gives the New Moon for *December* to be on the 22d Day, therefore 22 being ſubtracted from 27, there remains 5. whereby it appears the Moon is 5 Days old on the 27th of *December* in the Year 1764.

Example. Suppoſe it were required to find the Moon's Age on the 1ſt of *November* 1765.

The laſt New Moon before *Nov.* 1ſt was *Oct.* 14th, but becauſe you cannot take 14 from 1, you muſt add 31 (the Number of Days in *October*) and from the Sum 32 ſubtract 14. The Remainder 18 is the Moon's Age required.

A Tide Table for the Sea-Coaſt of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, ranged in Alphabetical Order.*

A.	H.	M.		H.	M.
AT *Army* N N E. and S S W.	01	30	At *Albarmorich* and *Antwerp*, E and W — — —	06	00
At *Amſterdam* and *Armentiers*, N E. and S W. — —	03	00	At *Alborough* S E. by S. and N W by N. — — —	09	45
At *Abarwark*, E N E. and W S W. — — —	04	30			

	H	M
B		
At *Beachy* and *Blacktail*, and before the *Race* of *Blanquet* or *Blanchart*, N and S — —	12	00
Thwart of *Beachy*, in the Offing, N by E and S by W — —	00	45
At *Blackneſs*, in *Bluet*, at *Bell-Iſle*, N N E and S S W — —	01	30
Without *Bluet*, and at *Berwick*, N E by N and S W by S - -	02	15
The River of *Bourdeaux*, the South Coaſt of *Bretagne*, the Coaſt of *Biſcay*, and at *Bochneſs*, N E and S W — — —	03	00
At *Breſt*, before the *Baſe*, the River of *Bourdeaux*, within the Haven, N E by E and S W by W	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, E N E and W S W — —	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, E and W — —	06	00
At *Briſtol* Key, E by S and W by N — —	06	45
At *Bridgewater*, E S E and W N W — —	07	30
At *Boulogne-deep*, SSE and NNW	10	30
C		
In *Condado*, N and S — —	12	00
In the *Chamber of Rye*, N by E and S by W — —	00	45
Without *Calais*, at *Corpus Chriſti* Point, before and at *Camfer*, NNE and S S W — — —	01	30
Between *Calais* and *Dover*, before *Conquet*, and at the North Cape, N E and S W — —	03	00
At *Cork*, *Calais*, *Cape Clear*, and in the *Creek*, E N E and W S W	04	30
At *Caldy*, and in the Bay of *Carmarthen*, E by N and W by S —	05	15
At *Concale*, E and W — —	06	00
Without the *Caſkets*, in the Channel, S E by S and N W by W	08	15
Between *Guernſey* and the *Caſkets*, before *Cromer*, before the *Caſkets* and *Guernſey*, *Seven Cliffs*, and at *Cathneſs*, S E and N W –	09	00
At the *Caſkets*, and at *Chamberneſs*, S E by S and N W by N —	09	45
At *Cows*, in the *Foſs of Caen*, in *Calais-Road*, and in *Chamberneſs-Road*, S S E and N N W —	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Crippleſand* and the *Creyl*, and at *Calſhot*, S by E and N by W — —	11	15
D		
At *Dover Pier*, and before *Dunkirk*, N and S — —	12	00
At *Denbigh* and *Downs*, in the Road, N E by N and S W by S	02	15
At *Dort*, N E and S W —	03	00
At *Dungarvan*, E N E and W S W — — —	04	30
At *Dartmouth*, E and W —	06	00
At *Dublin*, S E by E and N W by W — — —	10	15
At *Dunbar*, S E and N W —	09	00
At *Dungeneſs* and *Dunnoſe*, S E by S and N W by N — —	09	45
At *Dover*, *Dieppe*, and in the *Downs* aſhore, S S E and N N W	10	30
E		
At *Embden*, before the *Elbe*, before the *Eyder*, and before *Enchuſon*, N and S — —	12	00
At *Edam* N N E and S S W	01	30
Before the Eaſtern and Weſtern *Emes*, and at *Engomons*, S E and N W — — —	09	00
F		
On the Coaſt of *Flanders*, N and S — — —	12	00
At *Fluſhing*, N by E and S by W ——— ———	00	45

Before

	H	M
Before the *Fen*, in the Channel N N E and S S W	01	30
Without *Fountny*, N E by N and S W by S	02	15
Without the Banks of *Flanders*, N E and S W	03	00
At *Flamborough* and *Bridlington*, E N E and W S W	04	30
At the *Forn*, in *Foy*, at *Falmouth*, E by N and W by S	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, E by S and W by N	06	45
Before the Coaſt of *Friezeland* and the *Fly*, E S E and W N W	07	30
Without the *Fly*, S E by E and N W by W	08	15
At *Frize* and *Fair-Iſle*, N W and S E	09	00
At the *Frith*, and at the *South Foreland*, S S E and N N W	10	30
In *Fair-Iſle Roads*, and at the *North Foreland*, S by E and N by W	11	15
G		
In the Road of *Gibraltar*, at *Graveling*, and before *Cherburgh*, N and S	12	00
Before *Goeree*, at *Guernſey*, and at *Graveſend*, N N E and S S W	01	30
At *Groin*, at *Gaſcoign*, and the Coaſt of *Galicia*, N E and S W	03	00
Between *Guernſey* and *Caſkets*, S E and N W	09	00
Thwart of *Guernſey* in the Channel, SE by S. and N W by N	09	45
In the *Chamber* and *Goeree-end*, S by E and N by W	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton-Key*, N and S	12	00

	H	M
Under *Holy* Iſland, and at *Horn*, N N E and S S W	01	30
Before *Hartlepoole*, N E and S W	03	00
At *Huntcliff foot*, N E by E and S W by W	03	45
At *Humber*, E by N and W by S	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's* Mouth, E and W	06	00
At *Harlem*, *Havre de Grace*, and at *Homehead*, S E and N W	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich*, S S E and N N W	10	30
At *Harwich* within, S by E and N by W	11	15
I		
At *Jutland* Iſlands, N and S	12	00
On the Weſt Coaſt of *Ireland*, N E and S W	03	00
In all the Havens of the South Coaſt of *Ireland*, E by N and W by S	05	15
K		
Kentiſh Knock, N and S	12	00
At *Kelliers*, N E and S W	03	00
At *Kingſale*, E N E and W S W	04	30
At *Kilduyn*, E S E and W N W	07	30
At *Keldive*, S E and N W	09	00
L		
At *Leith*, N and S	12	00
At *Liſbon*, N E by N and S W by S	02	15
At *London*, N E and S W	03	00
Thwart of *Lundey*, and before *Lynn*, E by N and W by S	05	15
At *Lynn* Half-Tide, at *Lundey*, E and W	06	00
At *Lynn*, E by S and W by N	06	45
At the *Lizard* by the Land, E S E and W N W	07	30

	H	M
At *Lambay*, SE by E and NW by W	08	15
At *Leoſtoff*, and thwart of it without the Banks, SE by S and NW by N	09	45
In *Leoſtoff-Road* and at *Long-ſand-head*, SSE and NNW	10	30
M		
Within the *Maes* at *Maldon* N by E and S by W	00	45
Before the *Maes*, NNE and SSW	01	30
At the *Maes*, and before St. *Matthew*'s Point NE by E and SW by W	03	45
In *Mouſehole*, at St. *Matthew's* and within *Mount's-bay*, ENE and WSW	04	30
In *Milford*, at *Moonleſs*, at St. *Maloes*, E by N and W by S	05	15
Between *Mouſehole* and *Falmouth*, and in *Milford Haven*, ESE and WNW	07	30
In St. *Magnes* Sound, and at *Magnes* Caſtle, SE by E and NW by W	08	15
At the *Iſle* of *Man*, SE and NW	09	00
Before *Margate* S by E and N by W	11	15
N		
At *Newport* Half-tide N and S	12	00
At the Weſt-end of the *Nore*, N by E and S by W	00	45
Before the River of *Nantz* NE and SW	03	00
At *Newcaſtle* E by N and W by S	05	15
Before St. *Nicholas*, E by S and W by N	06	45
At the *Needles*, at the Iſle of *Wight*, SE by E and NW by W	08	15
All the Coaſt of *Normandy* and *Picardy*, SSE and NNW	10	30
Between the *Naze* and *Warhead* of *Lower*, S by E & N by W	11	15

	H	M
O		
At *Orkneſs* NE and SW	03	00
At *Orkney*, SE and NW	09	00
At *Orfordneſs*, SE by S and NW by N	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell Waves*, SSE and NNW	10	30
At *Orfordneſs*, within the Sands, S by E and N by W	11	15
At *Oſtend*, N and S	12	00
P		
At *Portſmouth*, Half-Tide, N by W and S by E	11	15
At the *Pens*, *Portbus*, and *Poictou*, NE and SW	03	00
On the Coaſt of *Portugal*, NE by E and SW by W	03	45
In *Plymouth*, and before St. *Paul's*, E by N and W by S	05	15
At St. *Paul*'s in the Haven E and W	06	00
Before *Podeſſemech*, E by S and W by N	06	45
Thwart of *Plymouth*, ESE and WNW	07	30
At the Race of *Portland*, SE and NW	09	00
Q		
At *Queenborough*, N and S	12	00
R		
At *Rocheſter*, N by E and S by W	00	45
At *Ramkins*, NNE and SSW	01	30
At *Rotterdam* in *Robin-Hood*'s Bay, and from the Race to the *Pole-head*, NE and SW	03	00
At *Rouen*, and before *Rochel*, NE by E and SW by W	03	45
In *Ramſey*, E by N and W by S	05	15
S		
In the *Sleeve*, between *Uſhant* and *Scilly*, at the *Shoe*, at the *Spits*, at *Southampton*, and along the *Swin*, N and S	12	00

Upon

	H	M
Upon the Coaſt of Spain, and in *Shetland*, NE and SW	03	00
At *Scilly*, the *Sound*, *Scarborough* and at *Staples*, NE by E & SW by W	03	45
At *Seven Iſles*, without the Haven, in the broad *Sound*, ENE and WSW	04	30
At the Mouth of *Severn*, between *Scilly*, and the *Lizard*, at the *Spurn*, and *Stockton*, E by N and W by S	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E and W	06	00
At *Sedmouth*, and at the *Start*, E by S and W by N	06	45
Off the *Start* in the Channel, ESE and WNW	07	30
Within the *Seine*, and before *Shelberg*, at 7 *Clifts*, SE and NW	09	00
At *Shoram*, SE by S and NW by N	09	45
At *Seine-head*, SSE and NNW	10	30

T

	H	M
Within *Tervere*, N by E and S by W	00	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE and SSE	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, NE and SW	03	00
At the *Cliffs* off the *Texel*, ENE and WSW	04	30
In *Torbay*, and before the *Texel*, E and W	06	00
In the Road of the *Texel*, ESE and WNW	07	30
At *Torgen*, SE by S and NW by N	09	45

U

	H	M
Before *Ureck*, N and S	12	00
At *Uſe*, NE and SW	03	00
Between *Uſhant*, and the Main, NE by E and SW by W	03	45
In the *Vourd*, at the Bay within *Uſhant*, ENE and WSW	04	30
Without *Uſhant*, E and W	06	00
St. *Valery*, SSE and NNW	10	30

W

	H	M
At *Winchelſea*, N by E and S by W	00	45
At the *Weilings*, and from the Weſt-end of the *Wight*, NNE and SSW	01	30
Before the *Weilings*, NE by N and SW by S	02	15
At *Whitby*, NE and SW	03	00
In the Sea of *Wales* and *Severn*, ENE and WSW	04	30
In *Wales*, E by N and W by S	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E and W	06	00
At *Weymouth* Key, E by S and W by N	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, ESE and WNW	07	30
Thwart of the Iſle of *Wight*, in the Channel, all within the iſle of *Wight*, between the Iſle of *Wight*, and *Beachy* by the ſhore, SE by E and NW by W	08	15
At the Eaſt end of the *Wight*, and on *Wieringhen* Flats, SE and NW	09	00

Y

	H	M
Before *Yarmouth*, NNE and SSW	01	00
At *Youghall*, ENE and WSW	04	30
At *Yarmouth*, SE by E and NW by W	08	15
In *Yarmouth* Road, in *Yarmouth* Haven, SSE and NNW	10	30

Z

	H	M
On the Coaſt of *Zealand*, NNE and SSW	01	30
In the *Zurick-Sea*, NE and SW	03	00

THE foregoing Table ſhews the Time of Full Sea at the ſeveral Places therein contained, upon the Full and Change Days of the Moon, which for more ready Uſe, is put in Alphabetic Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days, be required.

Look into the Table under the Letter (L) it is found to flow at *London* North Eaſt and South Weſt; that is, when it is full Sea at *London*, the Moon will be, as it is vulgarly ſaid, upon the North Eaſt and South Weſt Points of the Compaſs, which by the compaſs is 3 Hours.

The Uſe of this, together with the Moon's ſouthing, to find the Time of Full Sea at any Time, at any of the ſaid Places, is ſhewn below.

To find the Moon's Southing

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, the Quotient is the Time of Southing in Hours, and the Remainder is ſo many 12 min. of an Hour.

Note, If the Moon's Age exceed 15, reject the ſaid 15, and take the Remainder, with which proceed inſtead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppoſe the Time of the Moon's Southing be required on the 20th of *December*, 1753. The Moon's Age is found to be 25 Days, rejecting 15, the Remainder 10, which multiplied by 4 makes 40, which, divided by 5, gives the Quotient 8 Hours 00 Minutes, which is the Time of the Moon's Southing as was required.

I ſhall here add a Table of the Moon's Southing, to every Day of her Age.

Moon's Age.		Time. H	M
1	16	0	48
2	17	1	36
3	18	2	24
4	19	3	12
5	20	4	00
6	21	4	48
7	22	5	36
8	23	6	24
9	24	7	12
10	25	8	00
11	26	8	48
12	27	9	36
13	28	10	24
14	29	11	12
15	30	12	00

The Uſe of the TABLE.

The firſt and ſecond Columns ſhew the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required:

In the firſt Column under the Title Moon's Age, ſtands 9; over againſt it, in the laſt Column, is 7 Hours 12 Minutes, the Time of Southing required.

Note alſo, The ſame Southing ſerves for 24 Days old, as ſerves for nine Days, as the Table ſhews.

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppoſe the Moon to be 9 Days old, the Time of Full Sea in the *Downs* aſhore, is required :

By the foregoing Table it appears, that a NNW. and SSE. Moon makes full Sea, which as the ſaid Table ſhews, is 10 Hours 30 Minutes ; to which adding the Moon's Southing at nine Days old (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes (rejecting 12 Hours) in the Morning.

But to be more exact, uſe the following Table and Directions.

Moon's Age.		Time, H.	M.
1	16	0	43
2	17	1	20
3	18	1	52
4	19	2	22
5	20	2	52
6	21	3	26
7	22	4	7
8	23	4	55
9	24	5	50
10	25	6	53
11	26	7	59
12	27	9	4
13	28	10	8
14	29	11	5
15	30	00	0

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpoſe, enter this Table with the Moon's Age ; againſt which, in the laſt Column, are the Hours and Minutes to be added for the Time of Full Sea deſired.

Example.

Suppoſe as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* aſhore, is required :

A NNW. and SSE. Moon make Full Sea upon the Full and Change Days, which is 10 Hours 30 Min. this found, enter the oppoſite Table with the Moon's Age 9 Days, againſt which ſtands 5 Hours 50 Min. which added to 10 Hours 30 Min. makes 16 Hours 20 Min. or 4 Hours 20 Min. (rejecting 12 Hours) in the Morning.

Here follows

A New and Exact CALENDAR

OF

The Golden Number Epact, and Moveable Feaſts until the Year 1778 ; *as alſo of the Sun's Place and Declination to every Day of the year, for the Firſt, Second, Third, and Leap year, calculated for, and from the year* 1753, *and made to ſerve (without any conſiderable Error) till the year* 1768. *Likewiſe the Sun's Riſing, whereby may be found the Time of the Setting, and Length of the Day and Night ; together with the Southing of the Principal Fixed Stars at Midnight.*

A TABLE *of the* Dominical Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feasts, *for* 26 *Years to come.*

Years.	Dom. Letter.	Cycle of ☉	Prime.	Epact.	Shrove-Sunday.		Easter-Sunday.		Whit-Sunday.	
1753	G	26	6	25	March	4	April	22	June	10
1754	F	27	7	6	February	24		14		2
1755	E	28	8	17		9	March	30	May	18
1756	DC	1	9	28		29	April	18	June	6
1757	B	2	10	9		20		10	May	29
1758	A	3	11	20		5	March	26		14
1759	G	4	12	1		25	April	15	June	3
1760	FE	5	13	12		17		6	May	25
1761	D	6	14	23		1	March	22		10
1762	C	7	15	4		21	April	11		30
1763	B	8	16	15		13		3		22
1764	AG	9	17	26	March	4		22	June	10
1765	F	10	18	7	February	17		7	May	26
1766	E	11	19	18		9	March	30		18
16 7	D	12	1	0	March	1	April	19	June	7
1768	CB	13	2	11	February	14		3	May	22
1769	A	14	3	22		5	March	26		14
1770	G	15	4	3		25	April	15	June	3
1771	F	16	5	14		10	March	31	May	19
1772	ED	17	6	25	March	1	April	19	June	7
1773	C	18	7	6	February	21		11	May	30
1774	B	19	8	17		13		3		22
1775	A	20	9	28		26		16	June	4
1776	GF	21	10	9		18		7	May	26
1777	E	22	11	20		9	March	30		18
1778	D	23	12	1	March	1	April	19	June	7

January hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First 1769 1777 1785 1793		Year 1773 1781 1789 1797		Second 1770 1778 1786 1794		Year 1774 1782 1790 1798		Third 1771 1779 1787 1795		Year 1775 1783 1791 1799		Leap 1772 1780 1788 1796		Year 1776 1784 1792 1800	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M.
			♑		South.		♑		South.		♑		South.		♑		South.	
1	A	Circumcision.	11	22	23	00	11	07	23	01	10	52	23	02	10	37	23	03
2	B	Sun r. 8. 5.	12	23	22	54	12	08	22	55	11	53	22	57	11	38	22	58
3	C		13	24	22	48	13	09	22	50	12	54	22	51	12	40	22	52
4	D		14	25	22	42	14	10	22	43	13	55	22	45	13	41	22	46
5	E		15	26	22	35	15	11	22	37	14	57	22	39	14	42	22	40
6	F	Epiphany.	16	27	22	38	16	13	22	30	15	58	22	32	15	43	22	33
7	G		17	29	22	20	17	14	22	23	16	59	22	2	16	44	22	26
8	A	Caſtor & Pol.	18	30	22	12	18	15	22	15	18	00	22	16	17	45	22	18
9	B	Procyon.	19	31	22	04	19	16	22	06	19	01	22	08	18	47	22	10
10	C		20	32	21	55	20	17	21	57	20	03	21	59	19	48	22	01
11	D	Sun r. 7. 56.	21	33	21	45	21	18	21	48	21	04	21	50	20	49	21	52
12	E		22	34	21	35	22	19	21	38	22	04	21	40	21	50	21	42
13	F		23	35	21	25	23	21	21	28	23	06	21	30	22	51	21	33
14	G		24	36	21	14	24	22	21	17	24	07	21	20	23	52	21	23
15	A		25	37	21	03	25	23	21	06	25	08	21	09	24	53	21	12
16	B		26	39	20	52	26	24	20	55	26	09	20	58	25	54	21	01
17	C		27	40	20	40	27	25	20	43	27	10	20	46	26	55	20	49
18	D		28	41	20	28	28	26	20	31	28	11	20	35	27	56	20	37
19	E		29	42	20	15	29	27	20	18	29	12	20	21	28	58	20	25
20	F	Sol in Aqua.	♒	43	20	02	♒	28	20	05	♒	13	20	09	29	59	20	12
21	G		01	44	19	49	01	29	19	52	01	14	19	56	♒	00	19	59
22	A	Sun r. 7. 44.	02	45	19	35	02	30	19	38	02	16	19	42	02	01	19	45
23	B		03	46	19	21	03	31	19	24	03	17	19	28	03	02	19	32
24	C		04	47	19	06	04	32	19	10	04	18	19	14	04	03	19	17
25	D	Con. St. Paul.	05	48	18	51	05	32	18	55	05	19	18	59	05	04	19	03
26	E		06	49	18	36	06	34	18	40	06	19	18	44	06	05	18	48
27	F		07	50	18	21	07	35	18	25	07	20	18	29	07	06	18	32
28	G		08	51	18	05	08	36	18	09	08	21	18	13	08	07	18	17
29	A		09	52	17	49	09	37	17	53	09	22	17	56	09	07	18	01
30	B	K. Charles M.	10	53	17	32	10	38	17	37	10	23	17	40	10	08	17	45
31	C		11	53	17	15	11	39	17	20	11	24	17	23	11	09	17	28

February hath XXVIII Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First		Year		Second		Year		Third		Year		Leap		Year.	
			1769 1777 1785 1793		1773 1781 1789 1797		1770 1778 1786 1794		1774 1782 1790 1798		1771 1779 1787 1795		1775 1783 1791 1799		1772 1780 1788 1796		1776 1784 1792 1800	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.
			♒		South.		♒		South.		♒		South.		♒		South.	
1	D	Sun r. 7. 28.	12	54	16	58	12	40	17	03	12	25	17	06	12	10	17	11
2	E	Purif. Mary	13	55	16	41	13	40	16	45	13	26	16	49	13	11	16	54
3	F		14	56	16	23	14	41	16	27	14	27	16	31	14	12	16	36
4	G		15	57	16	05	15	42	16	10	15	27	16	14	15	12	16	18
5	A		16	57	15	47	16	43	15	52	16	28	15	56	16	13	16	00
6	B		17	58	15	28	17	43	15	33	17	29	15	38	17	14	15	42
7	C		18	59	15	10	18	44	15	14	18	29	15	19	18	15	15	24
8	D		19	59	14	51	19	45	14	55	19	30	15	00	19	15	15	05
9	E		21	00	14	31	20	46	14	36	20	31	14	41	20	16	14	46
10	F		22	01	14	12	21	46	14	17	21	31	14	22	21	17	14	27
11	G		23	01	13	52	22	47	13	57	22	32	14	02	22	18	14	07
12	A		24	02	13	32	23	47	13	37	23	33	13	42	23	18	13	47
13	B		25	02	13	12	24	48	13	17	24	33	13	22	24	19	13	27
14	C	Valentine.	26	03	12	51	25	48	12	57	25	34	13	02	25	19	13	07
15	D	Lion's Heart.	27	04	12	31	26	49	12	36	26	34	12	42	26	20	12	46
16	E	Lion's Neck.	28	04	12	10	27	49	12	15	27	35	12	21	27	20	12	26
17	F	Sun r. 7. 6.	29	05	11	49	28	50	11	54	28	36	12	00	28	21	12	05
18	G		♓	05	11	28	29	50	11	33	29	36	11	39	29	21	11	43
19	A	Sol in Piſces.	01	05	11	06	♓	51	11	11	♓	36	11	18	♓	21	11	22
20	B		02	06	10	45	01	51	10	50	01	37	10	56	01	22	11	01
21	C		03	06	10	23	02	51	10	28	02	37	10	34	02	22	10	40
22	D	Sun r. 6. 49.	04	06	10	01	03	52	10	07	03	37	10	12	03	23	10	18
23	E		05	07	09	39	04	52	09	45	04	37	09	50	04	23	09	56
24	F	St. Matthias.	06	07	09	17	05	52	09	23	05	38	09	28	05	23	09	34
25	G		07	07	08	55	06	53	09	00	06	38	09	06	06	23	09	12
26	A		08	07	08	32	07	53	08	38	07	38	08	44	07	24	08	49
27	B	Lower of the	09	07	08	10	08	53	08	15	08	38	08	21	08	24	08	27
28	C	2 foremoſt in	10	08	07	47	09	53	07	53	09	38	07	58	09	24	08	04
		☐ of Great																
29	D	Bear.	When it is Leap Year, February hath 29 Days.														07	41

March hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First Year 1769 1773 1777 1781 1785 1789 1793 1797				Second Year 1770 1774 1778 1782 1786 1790 1794 1798				Third Year 1771 1775 1779 1783 1787 1791 1795 1799				Leap Year 1772 1776 1780 1784 1788 1792 1796 1800			
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M
			♓		South.		♓		South.		♓		South.		♓		South.	
1	D	David.	11	08	07	24	10	53	07	30	10	39	07	36	11	24	07	18
2	E		12	08	07	01	11	53	07	07	11	39	07	13	12	24	06	55
3	F		13	08	06	38	12	53	06	44	12	39	06	50	13	24	06	32
4	G		14	08	06	15	13	53	06	21	13	39	06	27	14	24	06	09
5	A	Sun r. 6. 29.	15	08	05	52	14	53	05	58	14	39	06	03	15	24	05	46
6	B		16	08	05	29	15	53	05	35	15	39	05	40	16	24	05	23
7	C		17	08	05	06	16	53	05	12	16	39	05	17	17	24	04	59
8	D		18	08	04	42	17	53	04	48	17	39	04	54	18	24	04	36
9	E		19	08	04	19	18	53	04	25	18	38	04	30	19	24	04	13
10	F		20	07	03	55	19	53	04	02	19	38	04	07	20	24	03	49
11	G		21	07	03	32	20	53	03	38	20	38	03	43	21	23	03	26
12	A	Sun r. 6. 14.	22	07	03	08	21	52	03	14	21	38	03	20	22	23	03	02
13	B	Lyon's Tail	23	07	02	44	22	52	02	51	22	38	02	56	23	23	02	38
14	C	Lower of two	24	06	02	21	23	52	02	26	23	37	02	32	24	22	02	15
15	D	atter in ☐ of	25	06	01	57	24	52	02	03	24	37	02	08	25	22	01	51
16	E	great Bear.	26	05	01	33	25	51	01	40	25	37	01	45	26	22	01	28
17	F		27	05	01	10	26	51	01	16	26	36	01	21	27	21	01	04
18	G		28	05	00	46	27	50	00	52	27	36	00	57	28	21	00	40
19	A		29	04	00	22	28	50	00	29	28	35	00	34	29	20	00	16
20	B	Sol in Aries.	♈	04	Nor.	01	29	49	00	05	29	35	00	10	♈	20	Nor.	07
21	C	Upper of two	01	03	00	25	♈	49	Nor.	19	♈	34	Nor.	14	01	19	00	31
22	D	atter in ☐ of	02	02	00	49	01	48	00	4[illegible]	01	34	00	37	02	19	00	55
23	E	great Bear.	03	02	01	12	02	47	01	07	02	33	01	01	03	18	01	18
24	F		04	01	01	36	03	47	01	30	03	32	01	24	04	17	01	41
25	G	Lady-Day.	05	00	02	00	04	46	01	53	04	32	01	4[illegible]	05	17	02	05
26	A		06	00	02	23	05	45	02	17	05	31	02	12	06	16	02	29
27	B		06	59	02	47	06	44	02	49	06	30	02	35	07	15	02	52
28	C		07	58	03	10	07	44	03	04	07	29	02	58	08	14	03	15
29	D	Sun r. 5. 38.	08	57	03	33	08	43	03	27	08	29	03	22	09	13	03	39
30	E		09	56	03	57	09	42	03	51	09	28	03	45	10	12	04	02
31	F		10	56	04	20	10	41	04	14	10	27	04	08	11	12	04	25

April hath XXX Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First			Year	Second			Year	Third			Year	Leap			Year
			1769			1773	1770			1774	1771			1775	1772			1776
			1777			1781	1778			1782	1779			1783	1780			1784
			1785			1789	1786			1790	1787			1791	1788			1792
			1793			1797	1794			1798	1795			1799	1796			1800
			☉ pla.		☉ dec.		☉ pla.		☉ dec		☉ pla.		☉ dec.		☉ pla		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M	D.	M	D.	M.	D.	M.	D.	M
			♈		North		♈		North		♈		North		♈		North	
1	G	Laſt but two	11	55	04	43	11	40	04	37	11	26	04	31	12	11	04	49
2	A	in great Bear's	12	54	05	06	12	39	05	00	2	25	04	54	13	10	05	12
3	B	Tail.	13	53	05	29	13	38	05	22	3	24	05	17	14	09	05	35
4	C	Sun r. 5. 31.	14	52	05	52	14	37	05	46	14	23	05	40	15	08	05	57
5	D		15	51	06	15	15	36	06	09	5	22	06	03	16	06	06	20
6	E		16	49	06	37	16	35	06	32	16	21	06	26	17	05	06	43
7	F	Virgin's Spike	17	48	07	00	17	34	06	54	17	20	06	48	18	04	07	05
8	G		18	47	07	22	18	33	07	17	18	18	07	10	19	03	07	27
9	A	Laſt but one	19	46	07	45	19	31	07	39	19	17	07	33	20	02	07	50
10	B	in great Bear's	20	45	08	07	20	30	08	01	20	16	07	56	21	01	08	12
11	C	Tail.	21	44	08	29	21	29	08	23	21	15	08	18	21	59	08	34
12	D	Sun r. 5. 12.	22	42	08	51	22	28	08	45	22	13	08	40	22	58	08	56
13	E		23	41	09	13	23	26	09	07	23	12	09	02	23	57	09	18
14	F		24	39	09	34	24	25	09	29	24	11	09	23	24	55	09	39
15	G	Laſt in great	25	38	09	55	25	24	09	50	25	09	09	45	25	54	10	00
16	A	Bear's Tail.	26	37	10	17	26	22	10	11	26	08	10	07	26	52	10	21
17	B	Sun r. 5. 6.	27	35	10	38	27	21	10	32	27	06	10	28	27	51	10	42
18	C		28	34	10	59	28	19	10	53	28	05	10	49	28	49	11	03
19	D		29	32	11	20	29	18	11	14	29	03	11	10	29	48	11	24
20	E	Sol in Taurus.	♉	31	11	40	♉	16	11	35	♉	02	11	30	♉	46	11	45
21	F	Sun r. 4. 55.	01	29	12	01	01	14	11	55	01	00	11	50	01	45	12	05
22	G	Dragon's Tail.	02	27	12	21	02	13	12	15	01	59	12	10	02	43	12	26
23	A	St. George.	03	26	12	41	03	11	12	35	02	57	12	30	03	41	12	45
24	B	Arcturus.	04	24	13	01	04	09	12	55	03	55	12	50	04	40	13	05
25	C	St. Mark Evan.	05	22	13	20	05	08	13	15	04	54	13	10	05	38	13	25
26	D		06	20	13	39	06	06	13	34	05	52	13	29	06	36	13	44
27	E		07	19	13	59	07	04	13	53	06	50	13	48	07	34	14	03
28	F	Day incr. 6. 55.	08	17	14	18	08	02	14	12	07	48	14	07	08	33	14	22
29	G		09	15	14	36	09	01	14	31	08	47	14	26	09	31	14	41
30	A		10	13	14	55	09	59	14	50	09	45	14	45	10	29	14	59

May hath XXXI Days,

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Mid-night.	First Year 1769 1777 1785 1793		1773 1781 1789 1797		Second Year 1770 1778 1786 1794		1774 1782 1790 1798		Third Year 1771 1779 1787 1795		1775 1783 1791 1799		Leap Year 1772 1780 1788 1796		1776 1784 1792 1800	
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M	D.	M
			♉		North.		♉		North		♉		North		♉		North	
1	B	Phil. & Jac.	11	11	15	13	10	57	15	08	10	43	15	04	11	27	5	17
2	C		12	09	15	31	11	55	15	26	11	41	15	22	12	25	5	34
3	D	Sun r. 4. 38.	13	07	15	48	12	53	15	44	12	39	15	40	13	23	15	52
4	E		14	05	16	05	13	51	15	01	13	37	15	58	14	21	16	10
5	F	Upper of two	15	03	16	23	14	49	16	18	14	35	16	15	15	19	16	27
6	G	foremoſt in □	16	01	16	40	15	47	16	35	15	33	16	32	16	17	16	44
7	A	of little Bear.	16	59	16	56	16	45	16	52	16	31	16	49	17	15	17	00
8	B	N. Scale of ♎	17	57	17	13	17	43	17	09	17	29	17	05	18	13	17	17
9	C		18	55	17	29	18	41	17	25	18	27	17	22	19	11	17	32
10	D		19	53	17	44	19	39	17	41	19	25	17	37	20	08	17	48
11	E		20	51	18	00	20	36	17	56	20	22	17	52	21	06	18	04
12	F		21	49	18	15	21	34	18	11	21	20	18	07	22	04	18	19
13	G	Sun r. 4. 17.	22	46	18	30	22	32	18	26	22	18	18	22	23	02	18	34
14	A	Brighteſt in the	23	44	18	44	23	30	18	41	23	16	18	37	24	00	18	48
15	B	Crown.	24	42	18	59	24	27	18	56	24	12	18	52	24	57	19	02
16	C	Brighteſt in Serpent's neck.	25	39	19	13	25	25	19	10	25	11	19	06	25	25	19	16
17	D		26	37	19	26	26	23	19	24	26	09	19	20	26	53	19	29
18	E		27	35	19	39	27	21	19	37	27	07	19	34	27	50	19	42
19	F		28	33	19	52	28	18	19	50	28	04	19	47	28	48	19	55
20	G	Scorpion's Forehead.	29	30	20	05	29	16	20	02	29	02	20	00	29	46	20	08
21	A	Sol in Gemini.	♊	28	20	17	♊	14	20	14	30	00	20	12	♊	43	20	20
22	B	Sun r. 4. 5.	01	25	20	29	01	11	20	26	♊	57	20	24	01	41	20	32
23	C		02	23	20	41	02	09	20	38	01	55	20	36	02	38	20	43
24	D		03	20	20	52	03	06	20	50	02	52	20	47	03	36	20	54
25	E	Scorpion's	04	18	21	03	04	04	21	01	03	50	20	58	04	34	21	05
26	F	Heart.	05	16	21	13	05	02	21	11	04	47	21	09	05	31	21	15
27	G		06	13	21	23	05	59	21	21	05	45	21	19	06	28	21	25
28	A		07	11	21	33	06	56	21	31	06	42	21	29	07	26	21	35
29	B	K. C. II. B & R	08	08	21	42	07	54	21	40	07	40	21	38	08	23	21	44
30	C	Sun. r. 3. 55.	09	05	21	51	08	51	21	49	08	37	21	47	09	21	21	53
31	D		10	03	22	00	09	49	21	58	09	35	21	56	10	18	22	02

June hath XXX Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Mid-night.	Firſt Year 1769 1773 1777 1781 1785 1789 1793 1797				Second Year 1770 1774 1778 1782 1786 1790 1794 1798				Third Year 1771 1775 1779 1783 1787 1791 1795 1799				Leap Year. 1772 1776 1780 1784 1788 1792 1796 1800			
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♊		North		♊		North		♊		North		♊		North	
1	E	Sun r. 3. 52.	11	00	22	08	10	46	22	06	10	32	22	04	11	16	22	10
2	F		11	58	22	16	11	43	22	14	11	29	22	12	12	13	22	18
3	G		12	55	22	23	12	41	22	22	12	26	22	20	13	10	22	25
4	A		13	52	22	30	13	38	22	29	13	24	22	27	14	08	22	32
5	B		14	50	22	37	14	35	22	36	14	22	22	34	15	05	22	39
6	C	Sun r. 3. 50.	15	47	22	43	15	33	22	43	15	19	22	40	16	02	22	45
7	D		16	44	22	49	16	30	22	49	16	16	22	46	17	00	22	51
8	E		17	42	22	55	17	27	22	54	17	14	22	52	17	57	22	56
9	F		18	39	23	00	18	25	22	59	18	11	22	57	18	54	23	01
10	G		19	36	23	05	19	22	23	04	19	08	23	02	19	52	23	06
11	A		20	34	23	09	20	19	23	08	20	06	23	07	20	49	23	10
12	B	Sun r. 3. 48.	21	31	23	13	21	17	23	12	21	03	23	11	21	46	23	14
13	C		22	28	23	16	22	14	23	15	22	00	23	14	22	43	23	17
14	D		23	25	23	19	23	11	23	18	22	57	23	18	23	41	23	20
15	E		24	23	23	22	24	08	23	21	23	54	23	21	24	38	23	22
16	F		25	20	23	24	25	06	23	23	24	52	23	23	25	35	23	25
17	G		26	17	23	26	26	03	23	25	25	49	23	25	26	32	23	26
18	A		27	14	23	27	27	00	23	27	26	46	23	27	27	29	23	27
19	B		28	11	23	28	27	57	23	28	27	43	23	28	28	27	23	28
20	C		29	09	23	29	28	54	23	29	28	41	23	29	29	24	23	29
21	D	Sol in Cancer.	♋	06	23	29	29	52	23	29	29	38	23	29	♋	21	23	29
22	E	Sun r. 4. 4.	01	03	23	29	♋	49	23	29	♋	35	23	29	01	18	23	29
23	F		02	00	23	28	01	49	23	28	01	32	23	28	02	16	23	28
24	G	John Baptiſt.	02	58	23	27	02	42	23	27	02	29	23	28	03	12	23	27
25	A		03	55	23	26	03	40	23	26	03	27	23	27	04	10	23	25
26	B		04	52	23	24	04	38	23	24	04	24	23	25	05	07	23	23
27	C	Brighteſt in the Harp.	05	49	23	21	05	35	23	21	05	21	23	23	06	04	23	20
28	D		06	46	23	19	06	32	23	18	06	18	23	20	07	02	23	18
29	E	Peter Apoſtle.	07	43	23	15	07	29	23	15	07	15	23	17	07	59	23	15
30	F		08	41	23	12	08	26	23	12	08	13	23	14	08	56	23	11

July hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First Year 1769 1773 1777 1781 1785 1789 1793 1797				Second Year 1770 1774 1778 1782 1786 1790 1794 1798				Third Year 1771 1775 1779 1783 1787 1791 1795 1799				Leap Year 1772 1776 1780 1784 1788 1792 1796 1800			
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
					North		♋		North		♋		North		♋		North	
1	G		09	38	23	08	09	21	23	08	09	10	23	09	09	53	23	07
2	A		10	35	23	04	10	21	23	04	10	07	23	05	10	50	23	00
3	B		11	32	22	59	11	18	22	59	11	04	22	01	11	48	22	58
4	C		12	29	22	54	12	15	22	54	12	01	22	56	12	45	22	52
5	D		13	26	22	48	13	12	22	49	12	58	22	50	13	42	22	47
6	E		14	24	22	42	14	09	22	43	13	56	22	44	14	39	22	41
7	F	Sun r. 3. 53.	15	21	22	36	15	07	22	37	14	53	22	38	15	36	22	34
8	G		16	18	22	29	16	04	22	30	15	50	22	32	16	34	22	27
9	A		17	15	22	22	17	01	22	23	16	47	22	25	17	31	22	20
10	B		18	12	22	15	17	58	22	16	17	44	22	18	18	28	22	13
11	C		19	10	22	07	18	55	22	08	18	42	22	10	19	25	22	05
12	D	Sun r. 3. 58.	20	07	21	58	19	53	22	00	19	39	22	02	20	22	21	56
13	E		21	04	21	50	20	50	21	52	20	36	21	54	21	19	21	48
14	F		22	01	21	41	21	47	21	43	21	33	21	45	22	17	21	38
15	G		22	59	21	31	22	44	21	34	22	31	21	35	23	14	21	29
16	A		23	56	21	22	23	42	21	24	23	28	21	26	24	11	21	19
17	B		24	53	21	11	24	39	21	14	24	25	21	16	25	08	21	09
18	C		25	50	21	01	25	36	21	04	25	22	21	05	26	06	20	58
19	D		26	48	20	50	26	33	20	53	26	20	20	54	27	03	20	47
20	E		27	45	20	38	27	31	20	42	27	17	20	43	28	00	20	36
21	F		28	42	20	27	28	27	20	30	28	14	20	33	28	58	20	25
22	G	Sun r 4. 4.	29	39	20	15	29	26	20	18	29	11	20	23	29	55	20	13
23	A	Sol in Leo.	♌	37	20	03	♌	23	20	06	♌	09	20	11	♌	52	20	00
24	B		01	34	19	51	01	20	19	54	01	06	19	58	01	49	19	48
25	C	James Apoſtle.	02	31	19	38	02	17	19	41	02	03	19	45	02	47	19	35
26	D		03	29	19	25	03	15	19	28	03	01	19	31	03	44	19	21
27	E	Sun r. 4. 16.	04	26	19	11	04	12	19	15	03	58	19	18	04	42	19	08
28	F	Swan's Tail.	05	24	18	57	05	09	19	01	04	55	19	04	05	39	18	54
29	G	Dog Days beg.	06	21	18	43	06	07	18	47	05	53	18	50	06	36	18	40
30	A		07	18	18	29	07	04	18	32	06	50	18	36	07	34	18	26
31	B		08	16	18	14	08	02	18	18	07	48	18	21	08	31	18	10

Auguſt hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First			Year	Second			Year	Third			Year	Leap			Year
			1769 1777 1785 1793			1773 1781 1789 1797	1770 1778 1786 1794			1774 1782 1790 1798	1771 1779 1787 1795			1775 1783 1791 1799	1772 1780 1788 1796			1776 1784 1792 1800
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M
			♌		North		♌		North		♌		North		♌		North	
1	C	Lammas.	09	13	17	59	08	59	18	02	08	45	8	06	09	29	17	55
2	D	Sun r. 4. 20.	10	11	17	44	09	57	17	47	09	43	7	51	10	26	17	40
3	E		11	08	17	28	10	54	17	31	10	40	7	35	11	24	17	24
4	F		12	06	17	12	11	51	17	15	11	38	17	19	12	21	17	08
5	G		13	03	16	56	12	49	16	59	12	35	17	04	13	19	16	52
6	A		14	01	16	39	13	47	16	43	13	33	16	48	14	16	16	35
7	B		14	58	16	22	14	44	16	27	14	30	16	31	15	14	16	18
8	C		15	56	16	05	15	42	16	10	15	28	16	14	16	11	16	01
9	D		16	54	15	48	16	39	15	53	16	25	15	57	17	09	15	44
10	E		17	51	15	31	17	37	15	35	17	23	15	39	18	07	15	26
11	F	Sun r. 4. 35.	18	49	15	13	18	34	15	17	18	20	15	21	19	04	15	08
12	G		19	46	14	55	19	32	14	59	19	18	15	03	20	02	14	51
13	A		20	44	14	36	20	30	14	41	20	16	14	45	21	00	14	33
14	B	Sun r. 4. 39.	21	42	14	18	21	27	14	23	21	14	14	27	21	57	14	14
15	C		22	40	13	59	22	25	14	04	22	11	14	09	22	55	13	55
16	D		23	37	13	40	23	23	13	45	23	09	13	50	23	53	13	36
17	E		24	35	13	21	24	21	13	26	24	07	13	31	24	51	13	16
18	F		25	33	13	02	25	18	13	07	25	05	13	11	25	48	12	57
19	G		26	31	12	42	26	16	12	47	26	02	12	51	26	46	12	37
20	A		27	29	12	22	27	14	12	27	27	00	12	32	27	44	12	17
21	B	Sun r. 4. 53.	28	26	12	02	28	12	12	07	27	58	12	12	28	42	11	57
22	C		29	24	11	42	29	10	11	47	28	56	11	52	29	40	11	37
23	D	Sol in Virgo.	♍	22	11	22	♍	08	11	27	29	54	11	32	♍	38	11	17
24	E	Barthol. Ap.	01	20	11	01	01	06	11	06	♍	52	11	12	01	36	10	56
25	F		02	18	10	40	02	04	10	45	01	50	10	51	02	34	10	35
26	G		03	16	10	20	03	02	10	24	02	48	10	30	03	32	10	14
27	A		04	14	09	58	04	00	10	03	03	46	10	09	04	30	09	53
28	B		05	12	09	37	04	58	09	42	04	44	09	48	05	28	09	32
29			06	10	09	16	05	56	09	20	05	42	09	27	06	26	09	11
30	D	Sun r. 5. 13.	07	08	08	54	06	54	08	58	06	40	09	06	07	24	08	49
31			08	06	08	32	07	52	08	36	07	38	08	44	08	22	08	27

September hath XXX Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First 1769 1777 1785 1793		Year 1773 1781 1789 1797		Second 1770 1778 1786 1794		Year 1774 1782 1790 1798		Third 1771 1779 1787 1795		Year 1775 1783 1791 1799		Leap 1772 1780 1788 1796		Year 1776 1784 1792 1800	
			☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M	D.	M.
			♍		North.		♍		North		♏		North		♍		North	
1	F	Fomelhaut	09	05	08	11	08	50	08	15	08	36	08	22	09	20	08	05
2	G	Lond. b. 1666	10	03	07	49	09	49	07	54	09	34	08	00	10	18	07	43
3	A	First in Pegaſus's Wing.	11	01	07	27	10	47	07	32	10	33	07	38	11	17	07	21
4	B		11	59	07	05	11	45	07	10	11	31	07	16	12	15	06	59
5	C		12	58	06	42	12	43	06	47	12	29	06	54	13	13	06	37
6	D	Sun. r. 5. 28.	13	56	06	20	13	42	06	25	13	28	06	32	14	12	06	14
7	E	Dog-days end.	14	54	05	57	14	40	06	02	14	26	06	09	15	10	05	52
8	F		15	53	05	35	15	38	05	39	15	24	05	46	16	08	05	29
9	G		16	51	05	12	16	37	05	17	16	23	05	23	17	07	05	06
10	A		17	50	04	49	17	35	04	54	17	21	05	00	18	05	04	44
11	B		18	48	04	26	18	34	04	32	18	20	04	38	19	04	04	21
12	C	Sun r. 5. 35.	19	47	04	03	19	32	04	09	19	18	04	15	20	02	03	57
13	D		20	45	03	40	20	31	03	46	20	17	03	52	21	01	03	34
14	E		21	44	03	17	21	29	03	23	21	15	03	29	22	00	03	11
15	F		22	42	02	54	22	28	03	00	22	14	03	06	22	58	02	48
16	G		23	41	02	31	23	26	02	37	23	12	02	43	23	57	02	25
17	A	Sun r. 5. 49.	24	40	02	08	24	25	02	14	24	11	02	19	24	55	02	02
18	B		25	38	01	44	25	24	01	50	25	10	01	56	25	54	01	38
19	C		26	37	01	21	26	22	01	27	26	08	01	33	26	53	01	15
20	D	Androm. head.	27	33	00	57	27	21	01	03	27	07	01	09	27	52	00	52
21	E	Math. Evan.	28	34	00	34	28	20	00	39	28	06	00	45	28	51	00	29
22	F	Sun r. 6. 0. }	29	33	00	11	29	19	00	16	29	05	00	22	29	49	00	05
23	G	Sol in Lib. }	♎	32	Sou.	13	♎	18	Sou.	08	♎	03	Sou.	01	♎	48	Sou.	19
24	A	End in Pegaſus's Wing.	01	31	00	36	01	17	00	31	01	02	00	25	01	47	00	42
25	B		02	30	01	00	02	16	00	54	02	01	00	48	02	46	01	06
26	C		03	29	01	23	03	15	01	17	03	00	01	12	03	45	01	29
27	D	Sun r. 6. 9.	04	28	01	47	04	14	01	40	03	59	01	35	04	44	01	53
28	B	St. Michael.	05	27	02	10	05	13	02	04	04	58	01	59	05	43	02	61
29	C		06	26	02	34	06	12	02	28	05	57	02	22	06	42	02	39
30	D		07	25	02	57	07	11	02	52	06	57	02	45	07	41	03	03

October hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Mid-night.	First Year 1769 1773 1777 1781 1785 1789 1793 1797				Second Year 1770 1774 1778 1782 1786 1790 1794 1798				Third Year 1771 1775 1779 1783 1787 1791 1795 1799				Leap Year 1772 1776 1780 1784 1788 1792 1796 1800			
			☉ pla.		☉ dec.		☉ pla.		☉ dec		☉ pla.		☉ dec.		☉ pla.		☉ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M·
			♎		South		♎		South		♎		South		♎		South	
1	A	Sun r. 6. 13.	08	24	03	20	08	10	03	14	07	56	03	08	08	41	03	27
2	B		09	24	03	41	09	09	03	38	08	55	03	32	09	40	03	50
3	C		10	23	04	07	10	08	04	02	09	54	03	55	10	39	04	13
4	D		11	22	04	30	11	08	04	25	10	53	04	18	11	38	04	36
5	E	Pole Star.	12	21	04	54	12	07	04	48	11	53	04	41	12	38	04	59
6	F		13	21	05	17	13	06	05	11	12	52	05	04	13	37	05	22
7	G		14	20	05	40	14	06	05	34	13	51	05	27	14	36	05	45
8	A	Southermoſt in	15	19	06	03	15	05	05	57	14	51	05	50	15	36	06	08
		Adromeda's																
9	B	Girdle.	16	19	06	26	16	04	06	20	15	50	06	13	16	35	06	31
10	C	Sun r. 6. 29.	17	18	06	48	17	04	06	43	16	49	06	36	17	35	06	54
11	D		18	18	07	11	18	03	07	05	17	49	06	59	18	34	07	17
12	E	Sun r. 6. 35.	19	17	07	34	19	03	07	28	18	48	07	22	19	33	07	39
13	F		20	17	07	56	20	02	07	50	19	48	07	44	20	33	08	02
14	G		21	16	08	19	21	02	08	13	20	48	08	07	21	33	08	24
15	A		22	16	08	41	22	02	08	35	21	47	08	30	22	32	08	47
16	B		23	16	09	03	23	01	08	57	22	47	08	52	23	32	09	09
17	C		24	15	09	25	24	01	09	19	23	46	09	14	24	32	09	31
18	D	Luke Evan.	25	15	09	47	25	01	09	41	24	46	09	36	25	31	09	53
19	E		26	15	10	09	26	00	10	03	25	46	09	58	26	31	10	14
20	F		27	15	10	31	27	00	10	25	26	46	10	20	27	31	10	36
21	G	Sun r. 6. 52.	28	15	10	52	28	00	10	47	27	46	10	42	28	31	10	57
22	A	Andromeda's	29	14	11	13	29	00	11	08	28	45	11	04	29	31	11	19
23	B	Southermoſt	♏	14	11	34	♏	00	11	29	29	45	11	25	♏	31	11	40
24	C	Foot.	01	14	11	55	01	00	11	50	♏	45	11	45	01	31	12	01
—	—	Sol in Scorpio.																
25	D	Sun r. 7. 4.	02	14	12	16	02	00	12	11	01	45	12	05	02	31	12	21
26	E		03	14	12	37	03	00	12	32	02	45	12	26	03	31	12	42
27	F		04	14	12	57	04	00	12	52	03	45	12	47	04	31	13	02
28	G	Simon & Jude.	05	14	13	17	05	00	13	12	04	45	13	07	05	31	13	22
29	A		06	14	13	37	06	00	13	32	05	45	13	27	06	31	13	42
30	B	Sun. r. 7. 10.	07	14	13	57	07	00	13	52	06	45	13	47	07	31	14	02
31	C		08	13	14	17	08	00	14	12	07	45	14	07	08	31	14	22

November hath XXX Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First 1769 1777 1785 1793			Year 1773 1781 1789 1797	Second 1770 1778 1786 1794			Year 1774 1782 1790 1798	Third 1771 1779 1787 1795			Year 1775 1783 1791 1799	Leap 1772 1780 1788 1796			Year 1776 1784 1792 1800
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♏		South		♏		South		♏		South		♏		South	
1	D	All Saints.	09	15	14	36	09	00	14	31	08	46	14	26	09	31	14	41
2	E	Sun r. 7. 14.	10	15	14	55	10	00	14	50	09	46	14	46	10	31	15	00
3	F		11	15	15	14	11	01	15	09	10	46	15	05	11	32	15	19
4	G	K. Will. Nat.	12	15	15	33	12	01	15	28	11	46	15	24	12	32	15	37
5	A	Powder Plot.	13	16	15	51	13	01	15	47	12	47	15	42	13	32	15	55
6	B		14	16	16	09	14	01	16	05	13	47	16	00	14	33	16	13
7	C		15	16	16	27	15	02	16	23	14	47	16	18	15	33	16	31
8	D		16	17	16	44	16	02	16	41	15	48	16	36	16	33	16	49
9	E		17	17	17	01	17	03	16	58	16	48	16	54	17	34	17	06
10	F	Sun r. 7. 29.	18	18	17	18	18	03	17	15	17	48	17	11	18	34	17	23
11	G	Martin B.	19	18	17	35	19	03	17	32	18	49	17	28	19	35	17	39
12	A		20	19	17	51	20	04	17	48	19	49	17	44	20	35	17	55
13	B	Sun r. 7. 34.	21	19	18	07	21	04	18	04	20	50	18	00	21	36	18	11
14	C		22	20	18	23	22	05	18	20	21	50	18	16	22	36	18	27
15	D		23	20	18	38	23	06	18	35	22	51	18	32	23	37	18	42
16	E		24	21	18	54	24	06	18	50	23	51	18	47	24	37	18	57
17	F		25	21	19	08	25	07	19	05	24	52	19	02	25	38	19	12
18	G		26	22	19	23	26	07	19	19	25	53	19	16	26	39	19	26
19	A		27	22	19	37	27	08	19	33	26	53	19	30	27	39	19	40
20	B		28	23	19	50	28	09	19	47	27	54	19	44	28	40	19	54
21	C		29	24	20	04	29	10	20	00	28	55	19	57	29	41	20	07
22	D	Sol in Sagit.	♐	25	20	17	♐	10	20	13	29	55	20	10	♐	42	20	20
23	E		01	26	20	29	01	11	20	26	♐	56	20	23	01	42	20	32
24	F	Sun r. 7. 47.	02	26	20	41	02	12	20	38	01	57	20	35	02	43	20	44
25	G		03	27	20	53	03	13	20	50	02	58	20	47	03	44	20	56
26	A		04	28	21	04	04	13	21	02	03	59	20	59	04	45	21	07
27	B		05	29	21	15	05	14	21	13	04	59	21	10	05	46	21	18
28	C		06	30	21	26	06	15	21	24	06	00	21	21	06	47	21	29
29	D	Aldebaran.	07	31	21	36	07	16	21	34	07	01	21	31	07	47	21	39
30	E	Andrew Ap.	08	32	21	46	08	17	21	44	08	02	21	42	08	48	21	48

December hath XXXI Days.

Month Days.	Week Days.	Remarkable Days, and Southing of Stars at Midnight.	First Year 1769 1773 1777 1781 1785 1789 1793 1797				Second Year 1770 1774 1778 1782 1786 1790 1794 1798				Third Year 1771 1775 1779 1783 1787 1791 1795 1799				Leap Year. 1772 1776 1780 1784 1788 1792 1796 1800			
			⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.		⊙ pla.		⊙ dec.	
			D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
			♐		South		♐		South		♐		South		♐		South	
1	F	Sun r. 7. 58.	00	33	21	05	09	18	21	54	09	03	21	52	09	49	21	58
2	G		10	34	22	01	10	19	22	03	10	04	22	01	10	50	22	07
3	A		11	34	22	13	11	20	22	12	11	05	22	09	11	51	22	15
4	B		12	35	22	20	12	21	22	20	12	06	22	17	12	52	22	22
5	C		13	36	22	29	13	42	22	27	13	07	22	23	13	53	22	30
6	D		14	37	22	36	14	23	22	34	14	08	22	32	14	54	22	37
7	E		15	38	22	43	15	24	22	41	15	09	22	39	15	55	22	44
8	F		16	39	22	49	16	25	22	48	16	10	22	45	16	56	22	50
9	G		17	40	22	55	17	26	22	54	17	11	22	51	17	57	22	56
10	A		18	41	23	00	18	27	23	00	18	12	22	57	18	58	23	01
11	B	Sun r. 8. 5.	19	43	23	03	19	28	23	05	19	13	23	02	19	59	23	06
12	C	First in Orion's Belt.	20	44	23	10	20	29	23	10	20	14	23	07	21	00	23	11
13	D		21	45	23	14	21	30	23	14	21	15	23	11	22	01	23	15
14	E	Last in Orion's	22	46	23	17	22	31	23	17	22	16	23	15	23	03	23	18
15	F	Belt.	23	47	23	20	23	32	23	20	23	17	23	18	24	04	23	21
16	G		24	48	23	21	24	33	23	23	24	19	23	21	25	05	23	23
17	A	Orion's Right	25	49	23	23	25	34	23	25	25	20	23	24	26	06	23	25
18	B	Shoulder, and	26	50	23	27	26	35	23	27	26	21	23	26	27	07	23	27
19	C	Auriga's Right	27	51	23	28	27	37	23	28	27	22	23	27	28	08	23	28
20	D	Shoulder. Sun r. 8. 9.	28	53	23	29	28	38	23	29	28	23	23	28	29	09	23	29
21	E	Thomas Ap.	29	54	23	29	29	39	23	29	29	24	23	29	♑	11	23	29
22	F	Sol in Capri.	♑	55	23	29	♑	40	23	29	♑	25	23	29	01	12	23	29
23	G		01	56	23	28	01	41	23	28	01	27	23	29	02	13	23	28
24	A	Foot of G. Dog	02	57	23	27	02	43	23	27	02	28	23	28	03	14	23	27
25	B	Nat. of Christ	03	58	23	25	03	44	23	26	03	29	23	26	04	15	23	25
26	C	St. Stephen	05	00	23	23	04	45	23	24	04	30	23	24	05	16	23	22
27	D	St. John Evan.	06	01	23	21	05	46	23	21	05	31	23	22	06	18	23	19
28	E	Innocents.	07	02	23	18	06	47	23	18	06	32	23	19	07	19	23	16
29	F	Mouth of the	08	03	23	14	07	48	23	15	07	34	23	16	08	20	23	13
30	G	Great Dog, or	09	04	23	10	08	50	23	11	08	35	23	13	09	21	23	09
31	A	Syrius.	10	06	23	06	09	51	23	07	09	36	23	09	10	22	23	05

A TABLE of the Variation of the Sun's Declination to every 15 Degrees of Longitude, from the Meridian of *London*.

Degrees of Longitude from the Meridian of London.

Daily Varia.	D. 15	D. 30	D. 45	D. 60	D. 75	D. 90	D. 105	D. 120	D. 135	D. 150	D. 165	D. 180
Min.	m	m	m	m	m	m	m	m	m	m	m	m
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	05
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	0	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is 11 Columns, the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, *&c.* the third the Southing of ſeveral ſtars at Midnight, at which Time the ſaid Stars may (in the Abſence of the Moon, and Weather permitting) be obſerved, thereby to find the Latitude; in the ſame Column is given the time of Sun-riſing, (and by ſubtracting the time of riſing from 12 Hours, gives the time of ſetting) the eight following Columns ſhew the Sun's Place and Declination for the Firſt, Second, Third, and Leap-Year, according to their reſpective Titles.

For the more ready knowing of Leap-Year, the following Table is inſerted, where it is found by Inſpection, as alſo follow the Firſt, ſecond, and third Years after Leap-Year.

Firſt Year.	Second Year.	Third Year.	Leap-Year.
1753	1754	1755	1756
1757	1758	1759	1760
1761	1762	1763	1764
1765	1766	1767	1768
1769	1770	1771	1772
1773	1774	1775	1776
1777	1778	1779	1780
1781	1782	1783	1784

The Uſe of the Calendar.

To find the Day of the Week or Month, for any Time paſt or to come by the Calendar.

Firſt, Find the Dominical Letter for the Year, then proceed as follows:

Example 1. Suppoſe it is required to find what Day of the Month will be the third *Wedneſday* in *March*, 1755.

Having found the Dominical Letter by the Directions in Page 20, or by the Table in 35, to be E, turn to the Month of *March*, and account E for *Sunday*, then the Letter A is for *Wedneſday*, and the third *Wedneſday* is the 19th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1772.

This Year being Leap-Year has two Dominical Letters, E, and D; the firſt Letter, to wit, E, ſerving from the firſt of *January*, to the end of *February:* the laſt Letter, to wit, D, ſerves from thence to the Year's end.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Wedneſday*, the Day of the Week required.

To find the Sun's Place and Declination by the Calendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January*, 1756, being Leap-Year.

In the Month of *January* in the firſt column look the Day of the Month, over againſt which, under Leap year, ſtands 19.48, that is, the Sun's Place is in 19 deg. 48 min. of *Capricornus:* In the next column under the ſaid Year, ſtands 22d. 01, under the Title South, which ſhews the Declination to be 22 deg. 01 min. Southerly; and this alſo will practically ſerve for the Year 1760, for the ſaid 10th of *January*, being Leap Year.

Example 2. Suppoſe the Sun's Place and Declination is required on the 10th of *March*, 1762, being the ſecond after Leap-Year.

In the Month of *March*, in the firſt column find the Day of the Month, over againſt which, under Second Year, ſtands 19.53. which ſhews the Sun's Place is in 19 deg. 53 min. of *Piſces*; and in the next Column under ſecond Year, ſtands 04-02, which ſhews the Declination to be 04d. 02m. Southerly, which was required.

Although it is common to take the Declination as it is in the Calendar, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Calendar it is calculated for the Meridian of *London*, for which end the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Calendar, is added; the Uſe and Explanation whereof follows.

IN the firſt Column of this Table is the daily Variation, which is found by ſubtracting the Declination of the given Day of the Month found in the Calendar, from the Declination for the Day following: or contrarily this from that, that is, the leſſer from the greater, and the Difference is the daily Variation: In the Head of the other Columns are Degrees of Longitude from *London*, either Eaſterly or Weſterly, and in thoſe Columns under the reſpective deg. of Longitude, are the Minutes of the Declination, anſwerable to the daily Variation: As ſuppoſe the daily Variation was 10 min. and the Difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the Head of the Table, ſtands 2 Minutes, anſwering thereunto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declination.

The Rule. Firſt, If the Difference of the Longitude be weſterly, and the Declination increaſing, the Variation found in this Table muſt be added to the Declination found in the Calendar; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, If the Difference of Longitude be Eaſterly, and the Declination increaſing, the Variation aforeſaid muſt be ſubtracted; but the Declination decreaſing, it muſt be added.

Example 1. *April* the 19th, 1756, being at Sea, the Difference of Longitude from the Meridian of *London*, 90 Degrees Weſterly, I find the Declination in the Calendar to be 11 deg. 24 min. North; and the 20th Day, the Declination is 11 deg. 45 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 21 min. which is the daily increaſe: Then in the Table under 90 deg. and over againſt 21, ſtands 5 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 11 deg. 24 min. before found, which makes the true Declination 11 deg. 29 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 5 min. found in the Table muſt have been ſubtracted.

Note, It is eaſily diſcerned, whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer: for if it be greater, then it increaſes; but if leſs, then it decreaſes.

Example 2. *January* the 25th, 1759, being at Sea, the Difference of Longitude from *London* 120 deg. Weſterly: I find the Declination in the Calendar to be 18 deg. 59 min. South, and the 26th Day it is 18 deg. 44 min. therefore ſubtracting the leſſer from the greater, the Difference is 15 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 15 ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 18 deg. 54 min. South: If the Difference of Longitude had been Eaſterly, the 5 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Knowledge of the Sun's Declination at any Time, and in any Longitude, is of great Importance at Sea, for by this, and the Complement of the Sun's Meridian Altitude (commonly called the Zenith Diſtance) taken with a Quadrant or Croſs-ſtaff, is found the Latitude of the Place the Ship is then in; to perform which, take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude, North.

Example. Suppoſe at Sea the 10th of *April*, 1756, the Declination found by the Table is 08 deg. 12 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is —— 23° 10′ South.
Declination of the Sun is — — 08 12 North.
The Latitude of the Place is ——— 31 22 North.

Rule 2. If the Sun comes to the Meridian in the North, and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude, North: But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude, South.

Example 1. Suppoſe at Sea, *May* 20, 1756, the Declination being 20 deg. 08 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant, the Sun's Zenith Diſtance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's Declination is — — 20d. : 08m. North.
The Sun's Zenith Diſtance — — 18d. : 42m. North
The Latitude is — — — 1d. : 26m. North.

Example 2. At Sea, *June* 10th, 1753, the Sun's Declination by the Table is 23 deg. 5 min. North, the Complement of the Meridian Altitude by Obſervation, is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude, is — 33d. : 10m. North.
Sun's Declination — — 23d. : 05m. North
The Latitude is — — — 10d. : 05m. South.

Rule 3. If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude South.

Example 3. At Sea, *January* 29th, 1756, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22d. 10m. What is the Latitude?

Complement of the Sun's Meridian Altitude, is — 22d. : 10m. North.
Sun's Declination is — — 18d. : 01m. South.
The Latitude is — — — 40d. : 11m. South.

Rule 4. If the Sun comes to the Meridian in the South, and hath South Declination, ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South: But if the Complement of the Meridian Altitude exceed the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. At Sea, *January* 1ſt, 1756, the Sun cometh to the Meridian in the South: The Complement of the Altitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination — — — 23d. : 03m. South
Complement of the Meridian Altitude — 10d. : 36m. South.
Latitude of the Place — — 12d. : 27m. South.

Example 2. At Sea, *February* 18, 1754, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement of the Sun's Meridian Altitude — 25d. : 20m. South.
Sun's Declination — — — 11d. : 33m. South.
Latitude — — — 13d. . 47m. North.

Rule 5. If the Star be in the Zenith (that is, right over Head) and has either North or South Declination, that Declination is the Latitude either North or South, agreeable to the Name.

Rule 6. If the Sun has no Declination, the Complement of the Meridian Altitude is the Latitude, and is North or South, according as the Ship is to the Northward or Southward of the Sun.

Days.	Jan.		Februa.		March		April		May		June	
	☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.	
	h.	m.	h.	m.	h.	m	h.	m	h.	m.	h.	m.
1	18	48	21	00	22	49	00	43	02	34	04	36
2	18	52	21	04	22	53	00	46	02	38	04	40
3	18	57	21	08	22	57	00	50	02	41	04	44
4	19	01	21	12	23	00	00	54	02	45	04	49
5	19	06	21	16	23	04	00	57	02	49	04	53
6	19	10	21	20	23	08	01	01	02	53	04	57
7	19	14	21	24	23	12	01	04	02	57	05	01
8	19	19	21	28	23	15	01	08	03	01	05	05
9	19	23	21	32	23	19	01	12	03	05	05	09
10	19	27	21	36	23	23	01	15	03	08	05	13
11	19	32	21	40	23	26	01	19	03	12	05	17
12	19	36	21	44	23	30	01	23	03	16	05	22
13	19	40	21	48	23	34	01	26	03	20	05	26
14	19	45	21	52	23	37	01	30	03	24	05	30
15	19	49	21	56	23	41	01	34	03	28	05	34
16	19	53	22	00	23	45	01	38	03	32	05	38
17	19	58	22	04	23	48	01	41	03	36	05	42
18	20	02	22	08	23	52	01	45	03	40	05	47
19	20	06	22	11	23	55	01	49	03	44	05	51
20	20	10	22	15	23	59	01	52	03	48	05	55
21	20	15	22	19	00	03	01	56	03	52	05	59
22	20	19	22	23	00	06	02	00	03	56	06	03
23	20	23	22	27	00	10	02	04	04	00	06	07
24	20	27	22	30	00	14	02	07	04	04	06	11
25	20	32	22	34	00	17	02	11	04	08	06	16
26	20	36	22	38	00	21	02	15	04	12	06	20
27	20	40	22	42	00	24	02	19	04	16	06	24
28	20	44	22	45	00	28	02	22	04	20	06	28
29	20	48			00	32	02	26	04	24	06	32
30	20	52			00	35	02	30	04	28	06	36
31	20	56			00	39			04	32		

A Table of the Sun's Right Aſcenſion.

Days.	*July*		*Auguſt*		*Septem.*		*October*		*Novem.*		*Decem.*	
	☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.	
	h.	m.	h.	m.	h	m.	h.	m.	h.	m	h.	m.
1	06	40	08	46	10	42	12	30	14	26	16	30
2	06	45	08	49	10	45	12	33	14	30	16	34
3	06	49	08	53	10	49	12	37	14	34	16	39
4	06	53	08	57	10	53	12	41	14	38	16	43
5	06	57	09	01	10	56	12	44	14	42	16	47
6	07	01	09	05	11	00	12	48	14	46	16	52
7	07	05	09	09	11	03	12	52	14	50	16	56
8	07	09	09	13	11	07	12	55	14	54	17	01
9	07	13	09	16	11	11	12	59	14	58	17	05
10	07	18	09	20	11	14	13	03	15	02	17	09
11	07	22	09	24	11	18	13	06	15	06	17	13
12	07	26	09	28	11	21	13	10	15	10	17	18
13	07	30	09	31	11	25	13	14	15	14	17	23
14	07	34	09	35	11	28	13	17	15	18	17	27
15	07	38	09	39	11	32	13	21	15	23	17	31
16	07	42	09	43	11	36	13	25	15	27	17	36
17	07	46	09	46	11	39	13	29	15	31	17	40
18	07	50	09	50	11	43	13	32	15	35	17	45
19	07	54	09	54	11	46	13	36	15	39	17	49
20	07	58	09	58	11	50	13	40	15	43	17	54
21	08	02	10	01	11	54	13	44	15	48	17	58
22	08	06	10	05	11	57	13	48	15	51	18	03
23	08	10	10	09	12	01	13	51	15	56	18	07
24	08	14	10	12	12	04	13	55	16	00	18	12
25	08	18	10	16	12	08	13	59	16	04	18	16
26	08	22	10	20	12	12	14	03	16	09	18	20
27	08	26	10	23	12	15	14	07	16	13	18	25
28	08	30	10	27	12	19	14	11	16	17	18	29
29	08	34	10	31	12	22	14	15	16	22	18	34
30	08	38	10	34	12	26	14	18	16	26	18	38
31	08	42	10	38			14	22			18	42

A TABLE, ſhewing the Right Aſcenſion, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit.	Right Aſcen.		Declination.	
		h.	m.	d.	m.
END of Pegaſus's Wing, Algenib	2	00	01	13	48 N
Pole Star	2	00	43	87	59 N
Girdle of Andromeda	2	00	56	34	18 N
Bright Star in Aries	2	01	53	22	17 N
Meduſa's Head, Algol.	2	02	52	39	57 N
Bright Side of Perſeus	2	03	06	48	57 N
Aldebaran, or Bull's Eye	1	04	21	15	58 N
Capella, or the Goat	1	04	58	45	43 N
Bright Foot of Orion, Rigel	1	05	02	08	30 S
Middle Star in Orion's Belt	3	05	23	01	23 S
Orion's Right Shoulder	1	05	41	07	20 N
Auriga's Right Shoulder	2	05	40	44	53 N
Bright Foot of Gemini	2	06	22	16	35 N
Syrius, or the Great Dog	1	06	33	16	23 S
Caſtor, or Northermoſt Twin	2	07	18	32	24 N
Procyon, or the Little Dog	2	07	25	05	51 N
Pollux, or Southermoſt Twin	2	07	29	28	36 N
Hydra's Heart	1	09	14	07	36 S
Lyon's Heart, or Regulus	1	09	54	13	10 N
The Lower of the Pointers	2	10	45	57	42 N
The Upper of the Pointers	2	10	46	63	05 N
Lyon's Tail, Deneb	1	11	35	16	06 N
Upper of the two laſt in □ *of the Great Bear*	2	12	01	58	26 N
Laſt but two in the Great Bear's Tail	2	12	41	57	21 N
Virgin's Spike	1	13	10	09	51 S
Laſt but one in the Great Bear's Tail	2	13	12	56	14 N
Laſt in the Great Bear's Tail	2	13	36	50	34 N
Arcturus	1	14	02	20	30 N
South Ballance	2	14	35	15	00 S
Foremoſt Guard	2	14	49	75	10 N
Brighteſt of the Crown	2	15	22	27	34 N
Brighteſt in the Serpent's Neck	2	15	30	07	13 N
Antares, the Scorpion's Heart	1	16	12	25	51 S
Head of Hercules	3	17	00	14	41 N
Ophinous, or Serpent's Head	3	17	21	12	45 N
Lyra, or the Harp	1	18	26	38	34 N
Swan's Bill	3	19	17	27	29 N
Vulture, or Eagle's Heart.	2	19	35	08	14 N
Swan's Tail	2	20	30	42	24 N
Mouth of Pegaſus	3	21	29	8	45 N

Fomelhaut

Fomelhaut	1	22	40	30	56 S
Marchab, or Pegaſus's Wing	2	22	49	13	52 N
Scheat, or Pegaſus's Leg	2	22	48	26	44 N
Cepheus's Knee	3	23	20	76	7 N
Andromeda's Head	2	23	52	27	43 N

The Explanation and Uſe of the Table *of the* Sun's Right Aſcenſion, *and of the* Table *of the* Star's Right Aſcenſion *and* Declination.

IN the Table of the Sun's Right Aſcenſion, the firſt Page contains the firſt ſix Months of the Year; the next Page the other ſix Months; at the Head of the Table are the Months; in the firſt Column towards the Left-hand are the Days of the Month, and in the oppoſite Column is the Right Aſcenſion in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the firſt, towards the Left-hand, are the Names of the Stars: in the ſecond, the Stars Magnitude; in the third, the Right Aſcenſion in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

Firſt, to find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Aſcenſion of the Sun and Star, and ſubtract the Right Aſcenſion of the Sun from the Right Aſcenſion of the Star, but if the Star's Right Aſcenſion be leſs than the Sun's, add thereto 24 Hours, and then ſubtract; the Remainder aſter Subtraction, is the Time of the Star's coming upon the Meridian from Noon: But if the Remainder exceed 12 Hours, ſubtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppoſe the Time that *Fomelhaut* comes upon the Meridian on the 21ſt of *Octber* is required.

I find in the Table that Star's Right Aſcenſion to be 22 Hours 40 Min. and the Sun's to be 13 Hours 44 min. which ſubtracted from the Star's Right Aſcenſion, leaves 8 Hours 56 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppoſe the Time that the *Bull's Eye* comes upon the Meridian on the 26th of *October* was required.

I find the Star's Right Aſcenſion to be 4 Hours 21 min. the Sun's 14 Hours 3 min. Now becauſe the Sun's Right Aſcenſion is more than the Star's, add to the Star's Right Aſcenſion 24 Hours, which makes 28 Hours 21 min. from which ſubtracting the Sun's Right Aſcenſion 14 Hours 3 min. there remains 14 Hours 18 min. from which ſubtracting 12 Hours, there remains 2 Hours 18 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly. The Time being given, to find what Star will come to the Meridian about the ſame Time.

The Rule. To the Sun's Right Aſcenſion add the Time from Noon, at which the Star's coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Aſcenſion and Declination, where look what Star's Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *April* the 7th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 Hour 4 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Aſcenſion, makes 9 Hours 4 Minutes; the neareſt in the Table is *Hydra's-Heart*, whoſe Right Aſcenſion is 9 Hours 14 Minutes, and therefore Souths at 8 Hours 8 Minutes nearly, and ſo in others.

Directions for Obſerving the Stars, to find the Latitude of the Place.

Having before ſhewn how to find the Time of the Star's coming to the Meridian, I ſhall now ſhew by the Star's Altitude how to find the Latitude.

Note. In North Latitude, thoſe Stars whoſe North Declinations exceed the Complement of that Latitude may be obſerved under the Pole, and the ſame may be performed by the Southern Stars in South Latitude.

Particular Directions for finding the Latitude, by the Meridian Altitude of the fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Meridian Altitude or Zenith Diſtance, (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination, gives the Latitude North.

Example, On the 21ſt of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's Heart* comes to the Meridian in the South at 1 Hour 39 min. after Midnight; the Meridian Altitude by Obſervation was 63 Degrees; which ſubtracted from 90 Degrees there remains 27 Degrees the Complement of the Altitude; to which adding 13 Degrees 10 Minutes the Declination of the Star, North, gives 40 Degrees 10 Minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North : But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 21ſt of *July*, being at Sea, the Star *Fomelhaut* cometh to the Meridian in the South, at 2 Hours 38 minutes after Midnight, the Merid. Alt. 35 deg. 50 min. the Comp. whereof is 54 deg. 10 min. the Star's Declination is 30 deg. 56 min. South, which ſubtracted from the Complement of the Altitude leaves 23d. 14m. which is the Latitude North.

Example 2. Suppoſe on the 1ſt of *July*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 32 minutes at Night, the Complement of the Altitude is 5 deg. 27 minutes, the Declination 25 Degrees 51 minutes South, from which ſubtracting the Complement of the Altitude, there Remains 20 degrees 24 minutes, which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, ſubtract the Declination from the Complement of the Altitude, the Remainder is the Latitude South : But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 22*d* of *June* the *brighteſt in the Harp* comes to the Meridian in the North at 23 minutes after Midnight, the Complement of the Altitude is 79 degrees, from which ſubtracting the Declination, which is 38 degrees 34 minutes North, there remains 40 Degrees 26 Minutes, which is the Latitude South.

Example 2. On the 22*d* of *September*, *Andromeda's Head* comes to the Meridian in the North at 11 Hours 55 minutes at Night, the Complement of the Altitude is 7 degrees 10 minutes, which ſubtracted from the Declination 27 degrees 43 minutes, gives 20 degrees 33 minutes, which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 23*d* of *December* (*Syrius, or the Great Dog's Mouth*) comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 30 degrees, to which adding 16 degrees 23 minutes the Declination South, gives 46 degrees 23 minutes the Latitude South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Star's Declination.

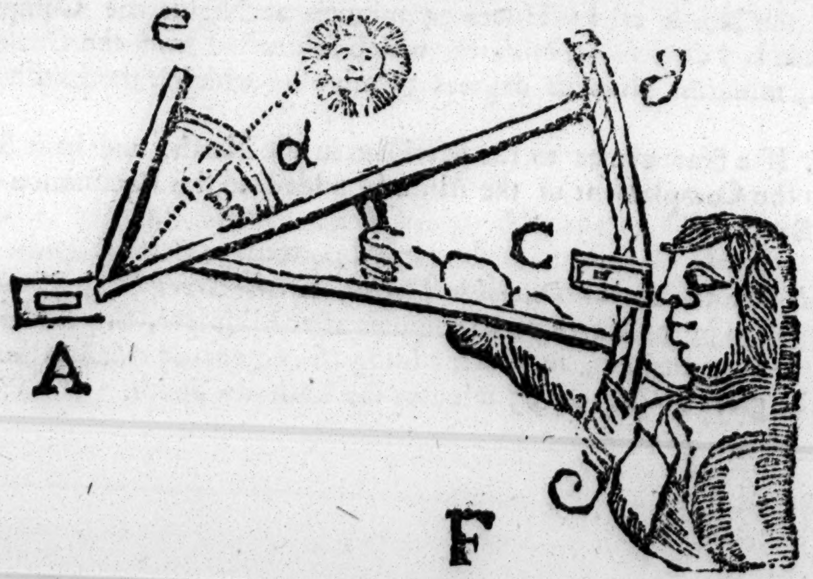
Example. On the *21ſt* of *March*, the Pole Star comes to the Meridian under the Pole at 40 minutes after Midnight, the Meridian Altitude, 44 degrees 30 minutes, the Complement of the Declination 2 degrees 1 minute, which added together gives 46 degrees 31 minutes, which is the Latitude, North.

Rule 6. If the Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star has no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward of the Obſerver.

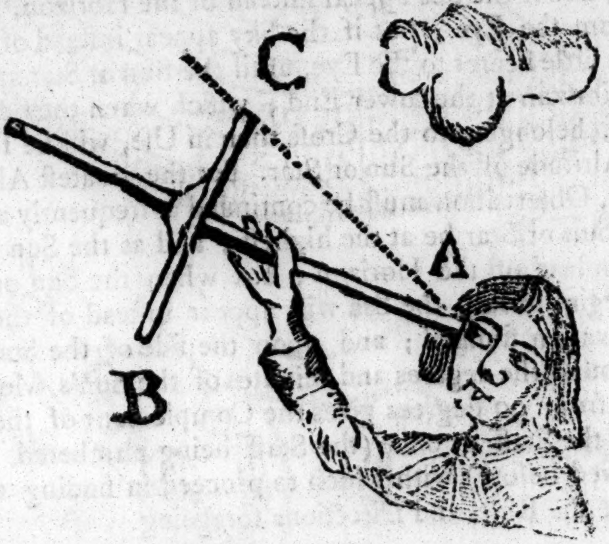
The Deſcription and Uſe of the Sea-Quadrant.

THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon, as at A; the Shade Vane, ſo called becauſe of its giving the Shadow upon the Horizon Vane in Time of Obſervation, as at B; beſides this Shade Vane, there is another now in uſe, having a Convex Glaſs properly fixed therein, which throws a Lucid Point upon the Line of Direction in the Horizon Vane, and is of great Service in gloomy Weather, when the Rays of the Sun are too weak to produce a diſtinct Shadow, by the former: (But the only Inſtrument for this purpoſe, and far ſuperior to any other now in Practice, is HADLEY's Quadrant;) Laſtly, the Sight Vane, which in Time of Obſervation is placed at the Eye, through which the Shadow (or lucid Point) and Horizon are ſeen, as at C. The leſſer of the Arches marked with *d e*, is called the Sixty-Arch, becauſe it contains 60 (or more commonly of late 65) Degrees: In Time of Obſervation, the Shade Vane is placed upon this Arch always to an even Degree; it is numbered from the upper end at *e*, downwards to *d*, with 5, 10, 15, 20, *&c.* The bigger Arch marked with *g* F, is called the Thirty-Arch, becauſe it contains 30 (or rather 25) Degrees and is divided into degrees and minutes.



The Uſe of this Inſtrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the ſixty (or leſſer Arch) to a Number of Degrees, leſs than the Complement of the Altitude by 15 or 20 d. and the Sight Vane upon the Thirty-Arch: The Vanes being thus fixed upon the Quadrant, your Back being turned to the Sun, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the Shadow of the upper Edge of the Shade Vane (or lucid Point in the Glaſs Vane) to fall upon the upper Part of the Slit in the Horizon Vane, where uſually (for Perſpicuity ſake) there is drawn a black Line, or Line of Direction; and if at the ſame Time the Horizon appear thro' the ſaid Slit in the Horizon Vane, you have then the Sun's preſent Altitude, or Zenith Diſtance; but if the Sea appear inſtead of the Horizon, then ſlide the ſight Vane lower towards F; if the Sky appear inſtead of the Horizon, then ſlide the ſight Vane a little higher, until the Horizon appear through the Horizon Vane: But to obtain the Meridian Altitude, (which is the greateſt Altitude the Sun will have that Day, and is the Thing uſed to find the Latitude,) continue obſerving, and as the Sun riſes, the Sea will appear through the Horizon Vane; then muſt the ſight Vane be removed lower: And thus continue obſerving, as often as may be convenient till the Sun be at the higheſt, which is the Meridian Altitude: When the Sun begins to fall, the Sky will appear inſtead of the Horizon, and then it is Time to give over obſerving for that Day: Having thus done, add the Degrees upon the ſixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude; the Uſe of which for finding the Latitude, is ſufficiently ſhewed in the preceding Rules.



The Deſcription and Uſe of the Croſs-ſtaff, *or* Foreſtaff.

THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and belongs to that ſide of the Staff which is numbered from about 3 degrees to 10 degrees: Sometimes the Thirty-Croſs, and the reſt of the Croſſes are ſo made, as that the Breadth of any of them may ſerve inſtead of this Ten-Croſs.

The ſecond Croſs is called the Thirty Croſs, and belongs to that ſide of the Staff which is numbered from about 10 degrees to 30.

The third Croſs is called the Sixty-Croſs, and belongs to that ſide of the Staff, which is numbered from about 20 to 60 degrees.

The fourth and laſt Croſs is called the Ninety-Croſs, and belongs to that ſide of the Staff, which is numbered from about 30 to 90 degrees.

This Staff is likewiſe numbered with the Complement to 90 degrees, (*viz.*) at 90 ſtands 80, at 20 ſtands 70, at 30 ſtands 60; and ſo of the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the Sun or Star, which is performed as followeth.

Firſt, Conſider how great the Sun's Meridian Altitude will be that Day; and accordingly uſe the Croſs moſt ſuitable (*viz.*) if the Meridian Altitude be judged to be under 10 degrees, uſe the Ten Croſs; if between 10 and 30, the Thirty-Croſs; if between 30 and 60, the Sixty Croſs: if between 60 and 90 the Ninety Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat or ſquare end of the Staff at A, to the outſide of the Eye, as near as may be, without hindering the Sight; thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper End of the Croſs, at C, for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appear inſtead of the Horizon, remove the Croſs a little farther from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff, belonging to the Croſs then in Uſe, will be found the degrees and minutes of Altitude of the Sun or Star. But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſide of the Staff proper to the Croſs uſed, are found the degrees and minutes of the Sun's Meridian Altitude; which ſubtracted from 90 degrees gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbered with the Complement as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions foregoing.

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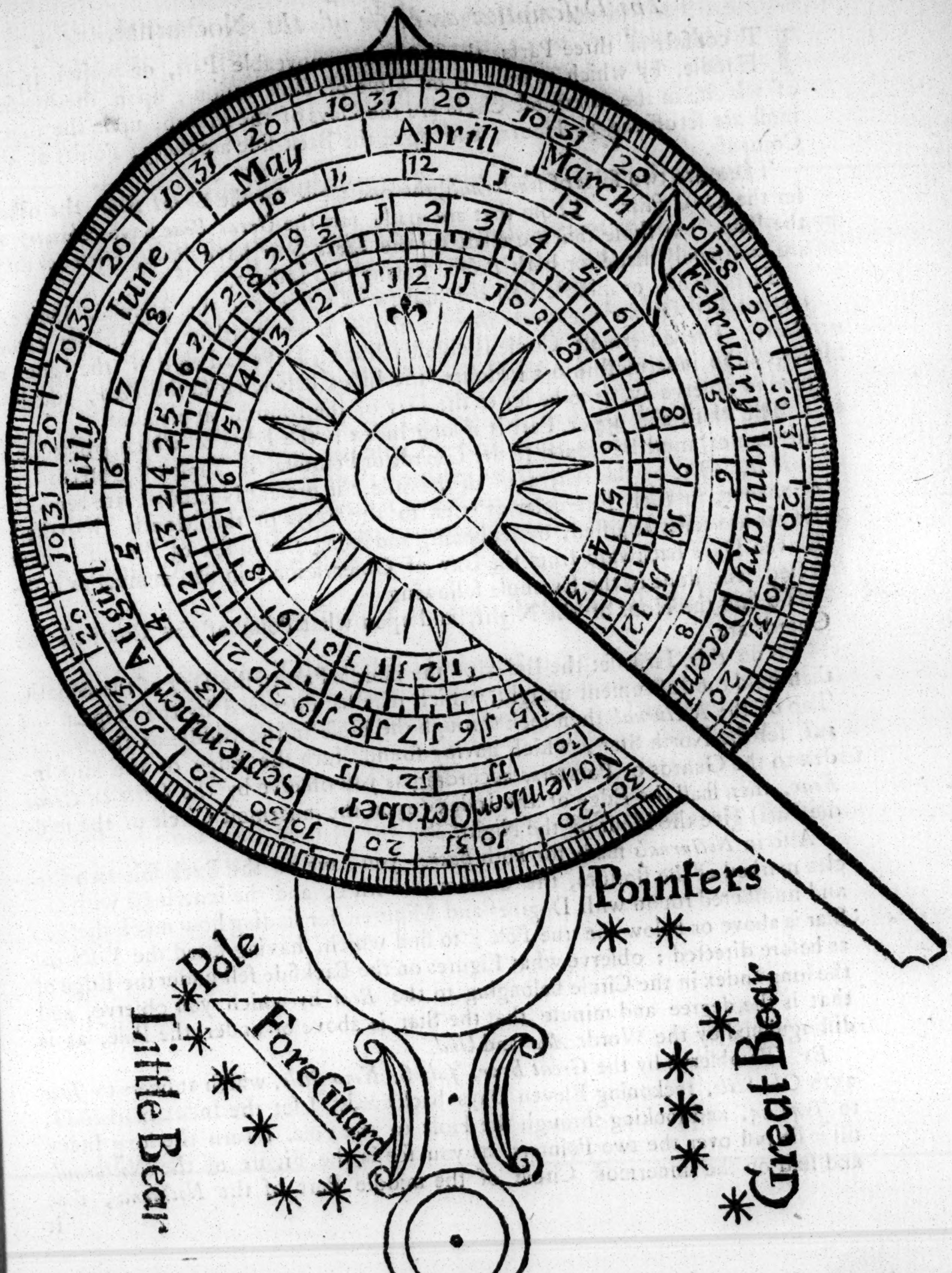
The Figure of the NOCTURNAL.



The Deſcription and Uſe of the Nocturnal.

IT conſiſts of three Parts, the firſt and unmoveable Part, on which is the Handle, by which to hold it in Time of Obſervation; upon the foreſide of which, in the outermoſt Circle are the Days of the Month, upon the innermoſt are ſet off the 24 Hours, and upon the Back-ſide are the 32 Points of the Compaſs.

There are two ſorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Thoſe that are made for the *Great Bear* have *February* at the Top, but thoſe that are made for the *Little Bear* have *April*, but now they are commonly made for both *Bears*, having two Indices.

The ſecond, or middle Part contains two Circles, and the aforeſaid Indices, one marked G, for the *Great Bear*, and the other marked L, for the *Little Bear*. The outermoſt Circle is divided into 29 Days and an half, the Moon's Age; the innermoſt into 24 Hours, the Index belonging to the *Bear*, you intend to obſerve by, is to be ſet to the Day of the Month, at pleaſure.

The third and upper Part is a long Index; the Edge of which (reſpecting the Center) muſt be turned to the Guards or Pointers, in Time of Obſervation.

Note, That by the Alteration of the Stile, the preſent Nocturnals are render'd erroneous, in ſuch Examples as refer to the Days of the Month; but theſe Errors are eaſily adjuſted, by reckoning and fixing the Index of the Inſtrument Eleven Days backward from the Day of Obſervation; in like manner as is directed, and done in the Example following.

To find the Hour of the Night, and upon what Point of the Compaſs the Guards are.

To do this, Firſt, ſet the Index of the middle Part to the Day of the Month, then hold the Inſtrument upright, which may be diſcerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Middle of the *Nocturnal*, for the North Star; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you obſerve by the *Little* or *Great Bear*, then ſhall the Edge of the Index (upon the innermoſt Circle of the middle Part) give the Hour of the Night.

Alſo in *Nocturnals* made for both *Bears*, you have on the Back-ſide two Circles marked at the Bottom, the outermoſt with L, and the innermoſt with G; and numbered round with Degrees and Minutes, for finding how much the *Pole* Star is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed; obſerve what Figures on the Backſide fell under the Edge of the long Index in the Circle belonging to the *Bear* by which you obſerve, and that is the degree and minute that the Star is above or under the Pole, as is diſtinguiſhed by the Words *Abo.* and *Und.*

Ex. To obſerve by the *Great Bear*, *July* 6, *New-Stile*, which anſwers to *June* 25th *Old-Stile*, reckoning Eleven Days backwards, I ſet the Index marked G, to *June* 25, and looking through the Hole to the Pole, I turn the long Index till it lie juſt over the two Pointers, as you ſee in the Figure of the *Nocturnal*, and find on the innermoſt Circle of the middle Part of the *Nocturnal*, that it is Two o'Clock in the Morning; and on the Back-ſide in the Circle marked G, I find the Pole Star is 2 degrees 26 minutes above the Pole, on the 6th of *July*, *New-Stile*, or according to the preſent eſtabliſhed Account: But the Bearings known, the Elevation or Depreſſion of the North-Star, above or below the Pole, is found by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermoſt Circle find the Moon's Age; and oppoſite to it in the innermoſt Circle of the ſame Piece ſtands the Southing.

Ex. Suppoſe the Moon 25 Days old, and the Time of her Southing required.

Look for 25 the Moon's Age in the outermoſt Circle, oppoſite to which in the innermoſt Circle ſtands 8, which is the Moon's Southing at 25 Days old required.

Note. That always between the Change and the Full, the Moon comes to the South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of flowing upon the Full and Change Days at any Place, and that gives the Time of Full Sea when required. But this has been ſufficiently ſhewed in another Place, and therefore needs no Example.

The Uſe of the following Table of the Sun's Declination of the North Star.

THE Uſe of the Table is this. Having taken the Altitude of the Pole Star, then obſerve with the *Nocturnal* upon what Point of the Compaſs the Guards are; oppoſite to which in this Table ſtands the Declination (ſo called) which if the Star be below the Pole, is to be added to the Altitude, but if the Star be above the Pole, to be ſubtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by thoſe other Directions for the Stars before given.

A Table *of the Declination of the* North Star, *on every Point of the Compaſs the Guards bear, and for both Sorts of* Nocturnals.

	Points of the Compaſs.	For the Fore-Guard of the Little Bear.				For the Guards of the Great Bear, called the two Pointers.		
		D.	M.			D.	M.	
If the former of the Guards be aſcending from the North, or lower Part of the Meridian.	North	2	9	Above the Pole	If the after Wheel, or two Pointers be aſcending from the North, or lower Part of the Meridian	2	20	Above the Pole
	N by E	1	52			2	30	
	N N E	1	29			2	35	
	NE by N	1	2			2	33	
	North Eaſt	0	35			2	26	
	NE by E	0	6			2	13	
	E N E	0	22	The North Star is under the Pole		1	55	
	Eaſt by North	0	52			1	33	
	Eaſt	1	18			1	7	
	Eaſt by South	1	41			0	38	
	E S E	2	01			0	8	
	S E by E	2	16			0	22	The North Star is under the Pole
	South Eaſt	2	25			0	52	
	S E by S	2	30			1	20	
	S S E	2	29			1	44	
	South by Eaſt	2	22			2	4	
If the former of the Guards be deſcending from the South, or upper Part of the Merid.	South	2	11		If the two Pointers be deſcending from the South or upper Part of the Meridian.	2	20	
	South by Weſt	1	55			2	30	
	S S W	1	34			2	29	
	S W by S	1	10			2	27	
	South Weſt	0	43			2	23	
	S W by W	0	14			2	13	
	W S W	0	15	Above the Pole		1	55	
	Weſt by South	0	44			1	33	
	Weſt	1	11			1	07	
	Weſt by North	1	30			0	38	
	W N W	1	58			0	8	
	N W by W	2	14			0	22	Ab. the Pole
	North Weſt	2	25			0	52	
	N W by N	2	30			1	20	
	N N W	2	29			1	44	
	North by Weſt	2	22			2	04	

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Iſlands in the World: Corrected by the lateſt and beſt Obſervations; the Longitude reckoned from the Meridian of LONDON.

Note, *When the Latitude and Longitude of an Iſland are given, the Middle of the Iſland is meant, except ſome particular Part of it is expreſſed.*

Places Names.	Latitude North.			Longit. E. or W.		
The Coaſt of England.	D.	M.		D.	M.	
Berwick	55	48		01	45	W
Newcaſtle	55	12		01	30	W
Stockton	54	33		01	25	W
Spurn	53	45		00	13	E
Yarmouth	52	40		01	38	E
LONDON	51	31		0	00	E
North Foreland	51	25		01	24	E
Beachy	50	46		00	25	E
Dunnoſe Iſle Wight	50	38	North Latitude	01	24	Weſt Longitude
Portland	50	30		02	44	
Start Point	50	07		03	47	
LIZARD	49	57		05	14	
Land's End	50	06		06	00	
St. Mary Scilly	50	00		06	46	
Hartland Point	51	06		04	35	
Lundy Iſle	51	20		04	40	
Briſtol	51	33		04	35	
St. David's Head	51	00		05	22	
Barſey or Iſle Bardſey	52	44		05	00	
Holyhead	53	24		04	50	
Liverpool	53	20		03	00	
Whitehaven	54	17		03	30	
Carliſle	54	47		03	05	
The Coaſt of Scotland.						
Glaſgow	55	52	N	04	05	W
N. Part of Sky Iſle	57	45	N	05	45	W

Places Names.	Latitude North.			Longitude E. or W.		
	D.	M.		D.	M.	
North Part of Lewis Iſland.	58	20	North Latitude	07	20	Weſt Longitude
St. Kilda	57	52		09	45	
Farro Head	58	34		05	10	
Northern Iſles of Orkney	59	10		03	22	
Shetland S. Point	60	04		02	00	
Buchaneſs	57	45		01	18	
Aberdeen	57	22		01	40	
Dundee	6	28		02	40	
Edinburgh	5	58		02	59	
The Coaſt of Ireland.						
Dublin	53	12	North Latitude	06	56	Weſt Longitude
Wexford	52	13		07	27	
Waterford	52	09		08	40	
Cork	51	49		09	30	
Cape Clear	51	17		11	10	
Limerick	52	23		09	35	
Galway	53	07		09	40	
Sline Head	53	20		11	15	
Londonderry	55	00		07	50	
Belfaſt	54	39		06	30	
The Coaſt of Holland and Flanders.						
Scaw	57	30	N	10	20	E
Helighland	54	24	N	08	35	E

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Names of Places.	Latitude North		Longitude E. or W.	
	D.	M.	D.	M.
Hamburgh	53	41	00	35
Embden	53	05	07	35
The Fly	53	15	05	30
The Texel	53	15	05	10
Amſterdam	52	23	05	04
Rotterdam	51	55	04	30
The Brill	52	00	04	00
Sluys	51	14	03	43
Calais	50	58	01	54

North Latitude. East Longitude.

The Coaſt of France and Portugal.

Names of Places.	Latitude North D.	M.	Longitude E. or W. D.	M.
Dieppe	49	56	01	09 E
Cape la Hogue	49	47	02	00
Caſkets	49	50	02	20
Guernſey	49	33	02	40
St. Maloe	48	39	01	57
Morlaix	48	33	03	49
Uſhant	48	30	05	02
Breſt	48	23	04	25
Penmark	47	48	04	24
Belle Iſle	47	18	03	16
Nantz	47	14	01	39
Iſland Dieu	46	34	02	13
Iſland Rey	46	10	01	30
Rochel	46	10	01	11
Bourdeaux	44	50	00	38
Bilboa	43	29	02	58
Cape Ortegal	44	04	07	48
Cape Finiſter	43	12	09	40
Port a Port	41	10	09	25
Burlings	39	35	09	24
Rock of Liſbon	38	52	09	50
Liſbon	38	42	08	53
Cape St. Vincent	36	53	09	06
Cadiz	36	33	06	01
Cape Trefalgar	36	10	06	01

North Latitude. Weſt Longitude.

The Coaſt on the Main Continent within the Straits.

Names of Places.	Latitude North D.	M.	Longitude E. or W. D.	M.
Gibraltar	36	12 N	04	53 W
Cape de Gat	36	40 N	01	40 W

Places Names.	Latitude North		Longitude E. or W.	
	D.	M.	D.	M.
Cape Paul	38	13	00	05
Cape St. Martin	38	46	00	40
Barcelona	41	26	02	18
Marſeilles	43	18	05	27
Toulon	43	07	06	02
Genoa	44	25	08	43
Leghorn	43	28	10	35
Rome	41	54	12	45
Naples	40	51	14	46
Cape Spartavento	37	53	16	55
Cape Collone	38	56	18	05
Gallipoli	39	56	18	43
Cape St. Mary	39	45	19	00
Ancona	43	40	14	26
Venice	45	25	12	10
Lepanto	38	10	22	52
Cape Matapan	36	33	22	41
Cape St. Angelo	36	32	23	56
Athens	37	58	24	05
Cape Martelo, S. P. of Negropont	38	07	25	03
Cape Monte Sancto	40	26	25	02
Salonica	40	41	23	13
Gallipoli	40	33	27	20
Conſtantinople	40	59	28	56
Smyrna	38	28	27	25
Epheſus	38	01	27	53
Antiochetta	36	30	32	46
Scanderoon	36	34	36	30
Aleppo	35	42	37	24
Tripoli	34	38	36	15
Alexandria	31	10	30	19
Cape Ruſato	32	48	21	25
Cape Meſurato	32	21	1[illegible]	17
Tripoly	32	54	13	10
Cape Bona	37	03	11	04
Bona	37	02	08	19
Algiers	37	50	03	16
Cape de tres forcas	35	30	02	04 W

North Latitude. Eaſt Longitude.

Tetuan

Places Names.	Latitude North			Longitude Weſt		
	D.	M.		D.	M.	
Tetuan	35	27 N		05	06 W	
Ceuta	35	54 N		04	45 W	
Tangier	35	42 N		05	22 W	
Iſlands within the Straits.						
Alboran	35	54		02	29 W	
Formentura	38	33		01	55	
Yvica	38	50		01	40	
Majorca	39	30		03	03	
Minorca City	39	51		04	52	
Port Mahon Minorca	39	42		04	12	
Gallitta	37	41		08	44	
Sardinia, South End	38	46		9	12	
Corſica, North End	42	56		09	50	
Gorgona	43	34		09	38	
Capria	43	03		10	27	
Liſboa, or Elba	42	45		11	00	
Meſſina	38	07	North Latitude.	16	20	Eaſt Longitude.
Maritimo	38	12		17	09	
Cape Paſſaro	36	38		15	40	
Malta	35	53		14	32	
Corfu	39	42		20	06	
Cephalonia	38	15		21	00	
Zante	37	46		21	14	
Modon, or Morea	36	52		21	31	
Lemnos	39	59		25	37	
Scio	38	22		26	12	
Liſſa	43	06		16	40	
C. St. John, Weſt End of Candy	35	15		24	00	
Cape Solomon, E. End of Candy	35	00		27	08	
Rhodes City	36	42		28	05	
Weſt End of Cyprus	34	57		32	23	
Eaſt End of Cyprus	35	31		35	00	
The Coaſt of Barbary and Guinea.						
Cape Spartel	35	50		05	49	
Sallee	33	51	North Latitude.	06	25	Weſt Longitude.
Cape Cantin	32	36		09	10	
Cape de Geer	30	27		10	06	
Cape Bajadore	26	04		15	35	
Cape Olerado	23	41		15	50	
Cape Blanco	20	32		17	35	
Senegal	15	28		16	25	

Places Names.	Latitude North.			Longitude E. or W.		
	D.	M.		D.	M.	
Cape de Verde	14	43		17	20	
River Gambia	13	08		15	31	Weſt Longitude.
Sierraleona	08	36		12	57	
Mezſurado	06	05		10	02	
Cape Palmas	04	13	North Latitude,	06	45	
Jaque Jaque	04	16		09	47	
Aſſene	04	15		07	17	
Cape 3 Points	04	28		01	50	
River Volta	05	55		03	25	
River Formoſa	07	00		07	20	
Cape Formoſa	04	15		06	40	
New Calabar	04	42		08	33	
Old Calabar	04	10		09	45	Eaſt Longitude.
River Camerones	03	25		10	10	
River de Angra	00	50		10	01	
Cape Lopas	00	55		09	55	
River Congo	05	40	S. Latitude.	15	25	
Angola	08	57		15	56	
Cape Negro	16	08		12	31	
Cape St. Thomas	24	10		14	43	
Secos	29	00		15	56	
Cape Bona Eſperance	34	07		19	35	
Weſtern Iſlands.						
Corvo	39	54		30	55	
Flores	39	32	North Latitude.	30	54	Weſt Longitude.
Fyal	38	53		28	15	
Pico	38	40		27	20	
St. George	38	52		26	03	
Tercera	38	57		25	34	
St. Michael	38	06		23	36	
St. Maries	36	59		23	38	
The Canary Iſlands.						
Ferro	27	54		17	45	
Palma	28	40	North Latitude.	17	36	Weſt Longitude.
Gomero	28	06		17	05	
Teneriff	28	23		16	28	
Madeira, Weſt End	32	44		17	26	
Porto Sancto	33	12		15	54	
Canaria	27	52		15	10	
Forteventura S. W.	28	05		13	36	
Lancerota	29	02		12	45	

Places Names.	Latitude N. or S.		Longitude E. or W.	
Cape de Verde Iſlands.	D.	M.	D.	M.
		North Latitude.		West Longitude.
St. Antonio	17	24	25	02
St. Vincent	17	04	24	39
St. Lucia	17	05	24	40
St. Nicholas	16	50	23	58
Brava's	14	28	24	02
Fuego	14	50	23	41
St. Jago	15	08	22	56
Iſle of May	15	14	22	02
Iſle of Sal	16	50	22	08
Bonaviſta	16	05	22	07
Southern Iſlands.				
St. Matthew's	01	30 S	06	01 W
Aſcenſion	07	40 S	14	25 W
St. Helena	16	00 S	06	14 W
Fernande Poo	02	40 N	10	30 E
Princeps	01	40 N	09	15 E
St Thomas	00	00	08	20 E
Annabona	02	10 S	07	27 E
The Coaſt on the Main Continent in the Eaſt-Indies.				
Cape Lagullas	34	54 S	21	20
Cape Bon Eſperance	34	07 S	19	35
Cape Corientes	23	40 S	36	17
Moſambique	15	04 S	41	10
River de Fuegos	00	41 S	41	15
		North Latitude.		East Longitude.
Cape Baſſos	04	00	47	38
Cape Guardefoy	11	44	51	20
Cape Raſulgat	22	41	59	45
CapeMuca or Muſcat	23	32	59	45
Buſero	29	45	49	20
Surat	21	10	72	25
Goa	15	31	73	50
Callecut	11	16	75	30
Cochin	09	54	75	55
Cape Comerine	07	50	77	25
Fort St. George	13	11	80	32

Places Names.	Latitude N. or S.		Longitude Eaſt.	
	D.	M.	D.	M.
		North Latitude.		Eaſt Longitude.
Dieu Point	16	08	81	32
Viſagapatam	17	43	83	57
Cape Palmiras	20	42	87	52
Ballaſore Road	21	16	87	48
Bengal	22	17	92	21
Cape Negrais	26	23	93	00
Malacca	02	12	102	10
Siam Entrance	14	18	100	55
Cambodia Entrance	10	28	105	00
Cochin	14	05	107	56
Macao	22	13	113	51
Canton.	23	14	113	06
Amoy or Quemoy	24	35	116	50
Laimpo	29	59	120	35
Nanquin	33	45	120	01
Iſlands in the Eaſt-Indies.				
		South Latitude.		Eaſt Longitude.
Madagaſcar } S. end	25	47	46	10
St.Laurence } ~~N.end~~	12	~~10~~	51	05
Mayetta	13	10	45	38
Mohilla	12	05	44	23
Comero	11	40	43	50
Juan de Nova	09	30	52	40
Mauritius	20	10	52	55
Diego Royes (mas	19	50	61	30
Romeras de Caſtela-	28	45	67	17
Amſterdam	38	40	72	45
St. Brandon	16	38	64	30
Diego Gratioſa	08	40	68	25
Quabella	05	53	52	36
Baſſas de Chagos	06	55	68	45
		N Latitude.		
Yas de Diego Reys	00	20	72	00
Maldivia { N. End	07	14	73	04
Maldivia { S. End	00	25	76	22
Malique	09	00	72	58
Sacatra	12	21	54	05
Abdeleur	12	04	53	04
C. Gallo de Zeylone	06	08	81	15

Places Names.	Latitude N. or S D.	M.		Longitude E. or W. D.	M.	
Yas de Amber	00	00	N. Latit.	52	30	Eaſt Longitude.
Andaman	11	10		73	32	
Nicobar	07	11		93	40	
Sumatra N. W. End	05	22		94	50	
Verkin's Iſland	02	22		94	07	
Naſſau Iſland	02	54	South Latitude.	99	32	
Bencola	03	55		104	08	
Sumatra S. E. End	05	22		105	10	
Engano or Trompeus	05	50		101	43	
Selam	08	20		102	13	
Princes Iſland	06	30		104	02	
Bantam in Java	06	11		105	55	
Batavia	06	16		106	46	
Java Eaſt end	08	32		103	37	
Straits of Sundy	06	02		105	46	
Banca South-end	03	20		106	45	
Borneo South Point	03	54		113	37	
Banda Iſles	04	55		127	17	
Celebes S. End	05	10		119	07	
N. End	01	40	North Latitude.	121	20	
Mindano Weſt Point	06	40		119	15	
Borneo North Point	07	40		113	05	
Luconia S.W Point	12	30		120	10	
N.E. Point	18	55		120	05	
Anian N.W. Point	19	30		107	00	
N.E. Point	19	55		109	55	
Formoſa S. Point	22	00		119	56	
N. Point	25	30		120	45	
Piſcadore Iſles	23	30		118	35	
Iſland Chuſan	30	38		120	35	
Japan S. E. Point	35	30		140	30	
S.W. Point	35	00		128	30	

The Coaſt of America in the South Sea, from California to Cape Horn.

Places Names.	Latitude N. or S. D.	M.		Longitude E. or W. D.	M.	
Cape St. Sebaſtian	42	45	N. Latitude.	127	55	W Longitude.
C. St. Lucas or Lucar	23	20		111	46	
Cape Corientes	18	50		110	30	
Aquapulco	17	05		104	18	
Aquatulco	15	27		102	03	
Guatimala	14	25		101	00	
Panama	08	50		81	52	
Bay Bonaventura	03	24	N	78	06	
Iſland Gallopega	00	00		90	10	
Cape del Ajuga	06	30	South Latitude.	84	50	Weſt Longitude.
Lima	12	15		77	30	
Arica	18	29		73	10	
La Serena	29	00		76	22	
J. Juan Fernandes	33	15		83	18	
Baldivia	39	35		81	10	
Port Steven	46	50		82	36	
Cape Victory	52	00		83	10	
Cape Horn	56	55		79	55	

The Coaſt of Brazile in South America, from Cape Horn to Cape Roque.

Places Names.	Latitude N. or S. D.	M.		Longitude E. or W. D.	M.	
Magellan E. Entrance	52	00	South Latitude.	75	05	Weſt Longitude.
River Julian	48	40		74	34	
Cape Blanco near R. Camarones	46	50		72	07	
Buenos Aires, R. Plat.	34	35		57	54	
River Grand	31	55		52	00	
St. Catherine's	27	50		49	00	
Cape Frio	23	00		42	20	
Spirito Sancto	19	59		42	10	
P. Segura	16	31		40	35	
Bay Todos Sanctos	12	46		41	00	
River St. Franciſco	10	50		37	50	
Olinda or Pernambuco	07	48		35	30	
Cape St. Auguſtine	08	35		35	20	
Cape Roque	05	00		35	47	
Triſtian D' Acunha	37	05		13	50	
Trinidada	20	30		30	00	

The Coaſt of the Main Continent in the Weſt-Indies.

Places Names.	Latitude N. or S. D.	M.		Longitude E. or W. D.	M.	
R Amazones Entran.	00	00	North Latitude.	49	56	Weſt Longitude.
North Cape	02	05		49	56	
Surinam	06	25		56	50	
Oronoque	08	15		59	25	
S. Conquibaca	12	40		70	42	
Carthagena	10	28		75	21	
Scot's Settlement	08	30		78	45	
Nicaragua Entrance	11	25		84	15	
Cape Catocha	21	20		86	01	

Cam-

Places Names.	Latitude North.		Longitude Weſt.	
	D.	M.	D.	M.
Campecha	19	30 N	92	10 W
La Vera Cruz	19	12 N	97	48 W
Mexico	20	00 N	103	35 W
Eſcondido	30	20 N	89	30 W
Cape Florida	24	57 N	80	30 W
The Caribbee Iſlands.	North Latitude.		Weſt Longitude.	
Trinidada	10	15	60	17
Tobago W. End	11	10	59	10
Granado	11	57	60	20
Barbadoes	22	58	58	50
St. Vincent	13	12	60	12
St. Lucia	13	55	60	04
Martinico	14	43	60	54
Dominico	15	23	60	30
Marigallante	15	58	60	20
Guadaloupe	16	10	61	15
Monſerat	16	45	62	15
Antigua	17	05	61	45
Nevis	17	05	62	32
St. Chriſtopher's	17	17	62	40
Barbuda	17	56	60	40
St. Bartholomew	17	52	62	06
St. Martin's	18	06	62	10
Anguilla	18	17	62	13
Virgin's	18	30	63	25
St. Cruize	17	52	63	30
Bieque	18	00	63	15
Porto Rico St John's	18	30	65	37
St. Dominga Hiſpan.	18	25	69	30
Port Royal Jamaica	17	40	76	32
Eaſt End of Cuba	20	15	73	55
Havanna	22	40	82	55
Bay Hondy	22	45	83	40
Cape St. Antonio	21	45	85	32
Bahama Iſlands	North Latitude.		Weſt Longitude.	
Bermudas	32	25 N	63	40 W
North Point Bahama Bank	27	50 N	78	35 W
Bahama Iſland	26	50	79	36
Abaco South Point	26	00	73	46
Harbour Iſland	25	37	76	47
Androſs North Point	25	10	78	50
Providence	25	00	77	20
Eleuthera S. Point	24	40	75	56
Cat Iſland	24	25	75	09
Watling's Iſland	24	03	74	35
Rum Key	23	45	74	50
Exuma	23	22	75	55
Crooked Iſle N. Point	22	56	74	12
Atkin's Key	22	17	74	05
Meraparvouz	21	58	74	45
Atwood Keys	23	10	73	35
French Keys	22	40	73	40
Mayaguana	22	35	72	46
Hogſties	21	17	73	55
Hyneago Weſt End	20	52	73	46
Caicos Bank N. Point	20	50	71	15
Turk's Iſland	21	35	70	08
Abrolho N. Point	21	35	69	06
Platewrack	20	10	68	15
The Coaſt of Carolina, Virginia, Maryland, Penſylvania, New-England, and New-foundland.	North Latitude.		Weſt Longitude.	
Charles Town upon Aſhly River	32	45	78	46
Cape Hatteras	35	15	74	20
Cape Henry	37	00	75	24
Cape Charles	37	16	74	16
Cape Hinlopen	38	50	74	56
Long Iſland	40	50	72	45
New York	40	58	73	53

Cape

Places Names.	Latitude North. D.	M.	Longitude Weſt. D.	M.
Cape Cod	42	12	68	55
Boſton Entrance	42	30	69	23
Cape Sable	43	50	64	58
Iſland Sable	44	20	59	01
Cape Breton	46	00	58	30
Quebec	46	55	69	48
Bay of Breſt	52	10	56	57
Belle Iſland	52	07	55	35
Cape St. John	50	25	52	48
Cape Bonaviſta	49	15	52	12
Trinity Bay Entrance	48	52	52	20
Conception Bay Ent.	48	20	52	08
St. John's Harbour	48	00	51	39
Bay of Bulls	47	50	51	29
Cape Race	46	40	51	52
Cape St. Mary	47	10	53	23
Placentia Bay	47	45	53	58
Cape Roy	48	00	57	40
The Coaſt of Hudſon's-Bay and the Straits.				
Button Iſles	60	25	66	27
Cape Charles	62	10	75	35
Cape Walſingham	62	35	77	55
Mansfield Iſle	61	42	80	30
Cape Jones	54	55	78	58
Rupert's River	51	30	79	26
Albany Fort	52	26	84	50
The Cubbs	54	10	82	40
C. Henrietta Maria	55	07	84	30
Port Nelſon	57	10	93	58
Cape Churchil	59	00	95	20
C. Southampton	61	55	86	48
Shark Point	64	30	82	55
Nottingham Iſle	63	30	79	53
Q. Ann's Foreland	63	48	74	45
Reſolution Iſle	61	50	65	04
Cape Farewell	59	45	46	45

Places Names	Latitude North. D.	M.	Longit ude E. or W. D.	M.
The Coaſt of Iceland, Greenland, Nova-Zembla, and the Northern Iſles.				
Sound Royal	66	22	24	33
Bargarer's Point	66	20	16	35
Whales Back	65	27	20	33
Merchants Foreland	63	25	17	05
Halliford	64	30	34	43
Fair Foreland	66	20	26	27
Grim's Iſland	67	15	22	34
Weſtmania Iſles	63	30	22	54
Iſles of Fero	62	06	05	00
Beerenberg, or JohnMain's Iſle	71	45	04	30
Point Look out	76	25	15	36
Horn Sound	76	45	13	36
Fair Foreland	79	20	10	52
Hacluit's Headland	79	55	11	00
Helie's Sound	78	55	21	50
Lee's Foreland	78	05	23	25
Whale's Head	77	18	21	30
Hope Iſland	76	18	23	45
Cherry or Bear Iſle	74	30	18	08
Admiralty Iſland	75	05	59	50
Fretum Borough	70	00	61	20
Cape Candenoſe	69	05	42	35
Catnoſe	65	43	35	14
Archangel	64	30	40	30
Croſs Iſland	66	31	36	33
Sweetnoſe	68	10	34	45
Kilduyn	69	30	31	20
North Cape	71	23	23	02
Surroy Iſle	71	05	16	40
Tromſound	70	25	15	30
Loefort S.W. Point	68	15	09	30
Dronten	63	40	10	15
Stadland	62	10	04	38
North-bergen	60	10	05	40
Naze of Norway	57	45	07	24

Places Names.	Latitude North		Longitude Eaſt.		Places Names.	Latitude North.		Longitude Eaſt	
Sea Coaſt in the Sound and Baltic Sea.	D.	M.	D.	M.		D.	M.	D.	M.
Maerden, or Mardel	58	19	08	57	Narva	59	27	28	25
Larwic	58	54	09	20	Revel	59	35	24	51
Chriſtiana	59	40	10	00	Riga	57	04	25	15
Maeſterland	57	53	11	45	Derwinda	57	15	22	06
Gottenburg Gat	57	50	12	15	Coningſburg	54	43	21	35
Elſenore	56	22	12	42	Dantzick	54	22	18	36
Roſtock	54	37	18	40	Wiſby in Gotland	57	30	18	30
Copenhagen	55	41	12	50	Bornholm	55	15	14	45
Valſterborn	55	28	13	00	Straelſund	54	25	13	16
Uraniburg	55	54	12	58	Lubec	54	06	09	55
Calmer	56	40	16	35	Anout, or Anholt	56	50	11	06
Stockholm	59	20	19	30	Leſou, or Leſnou	57	05	10	30
Wyburg	60	52	29	16	Scaw	57	30	10	20
Peterſburg	60	00	30	25					

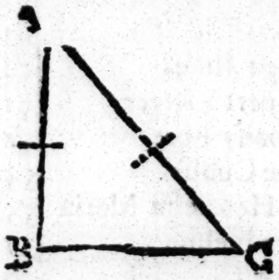
North Latitude East Longitude North Latitude East Longitude

Problems of Plane Sailing, wrought by Logarithms, *and by* Gunter's*-Scale.*

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſails South Weſt by South 382 Minutes, and the Difference of Latitude and Departure are required.



In the Right-angled Triangle A B C.
A C repreſents the Diſtance ſailed.
A B the Difference of Latitude.
B C the Departure.
B A C (or the Angle at A) the Angle of the Courſe.
A C B (or the Angle at C) the Complement of the Courſe to 90 deg.

Characters uſed in Navigation *and* Aſtronomy.

S. ſtands for Sine.
T. for Tangent.
S. c. Sine Complement. T. c. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a Daſh(ʹ).
The required Sides and Angles with a Cypher thus (°).

The Operation by Logarithms. *For the Difference of Latitude.*

As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is the S. c. of the Courſe 56d. 15m.	9.919846
To the Difference of Latitude 317.6 Minutes	12.501909

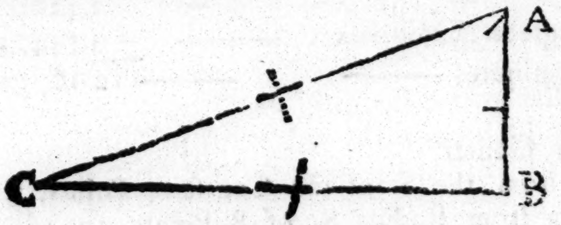
For the Departure.

As Radius	10.000000
To the Diſtance ſailed 382 Minutes	2.582063
So is the S. of the Courſe 33d. 45m.	9.744739
To the Departure 212.2 Minutes	12.326802

The Operation by Gunter's *Scale.*

One Foot of the Compaſſes being in the Radius, or S. of 8 Points; extend the other to the Diſtance 382 Minutes, the ſaid Extent laid from S. Courſe 3 Points, will reach to 212.2 Minutes, the Departure from the Meridian, and the Compaſſes kept at the ſame Diſtance, will reach from the S. c. Courſe 5 Points to 317.6 Minutes, the Difference of Latitude, as above.

PROB. II. The Courſe and Difference of Latitude given, to find the Diſtance and Departure.



Suppoſe a Ship ſails WSW. until the Difference of Latitude be 219 Leagues, and the Diſtance and Departure required.

The Operation by Logarithms. *For the Diſtance.*

As the S. c. of the Curſe 22d. 30m.	9.582840
To the Difference of Latitude 219 Leagues	2.340444
So is Radius	10.000000
To the Diſtance, which is 572.2 Leagues	2.757604

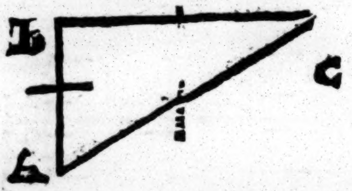
For the Departure.

As Radius — — — — — — — 10.000000
To the Diſtance 572.2 Leagues, found before — — —2.757548
So is the Sine of the Courſe 67 degrees 30 minutes — — 9.965615
To the Departure 528.6 Leagues — — — —12.723163

By Gunter.

The Compaſſes being extended from the S. of 2 Points, the Complement of the Courſe to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572.2 Leagues, the Diſtance, and the ſame Extent of the Compaſſes from the Sine of the Courſe 6 Points, will reach to 528.6 Leagues, the Departure.

PROB. III. The Courſe and Departure given, to find the Diſtance and Difference of Latitude.



Suppoſe a Ship ſails North Eaſt by Eaſt, and her Departure be 220 Minutes, the Diſtance and Difference of Latitude required.

By Logarithms. *For the Diſtance.*

As the S. of the Courſe 56 degrees 15 minutes — — —9.919846
To the Departure 220 minutes — — — —2.342423
So is Radius——— ——— ——— ———10.000000
To the Diſtance 264.6 Minutes — — —12.422577

For the Difference of Latitude.

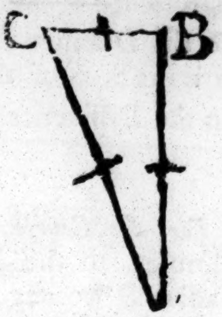
As Radius ——— ——— ——— 10.000000
To the Diſtance 264.6 Minutes— — — — 2.422590
So is the S. c. of the Courſe 33 degrees 45 minutes ——— 9.744739
To the Difference of Latitude 147 minutes ——— ———12.167329

By Gunter.

The extent of the Compaſſes from the S. of the Courſe 5 Points, the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 264.6 the Diſtance; and the ſame Extent of the Compaſſes from S. 3 Points the Complement of the Courſe, will reach to the Difference of Latitude 147 minutes as above.

PROB. IV. The Diſtance and Difference of Latitude given, to find the Courſe and Departure.

Suppoſe a Ship ſails between the North and the Weſt 206 Miles, until the Difference of Latitude be 197 Miles, the Courſe and Departure required.



By Logarithms. *For the Courſe.*

As the Diſtance 206 Miles— — — —	2.313867
To the Radius— — — — —	—10.000000
So is the Difference of Latitude, 197 Miles— —	—2.294466
To the S. c. of the Courſe ; which is North 17d. 00 m. Weſt	—9.980599

For the Departure.

As the Radius— — — — —	10.000000
To the Diſtance 206 Miles— — — —	—2.313867
So is the South of the Courſe 17 degrees 00 minutes— —	—9.465935
To the Departure 60.23 Miles— — —	—11.779802

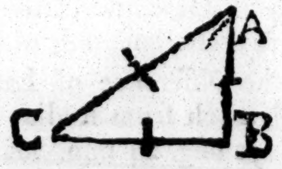
By Gunter.

For the Courſe. The Extent from the Diſtance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius South 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courſe, which ſubtracted from 90 deg. is 17d. 00 min. the Courſe N. Weſterly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Courſe 17 deg. 00 min. will reach from the Diſtance 206 Minutes, to the Departure 60.23 m. as above.

PROB. V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.

Suppoſe a Ship ſails between the S. and the Weſt 247 Minutes, until the Departure be 197 Minutes required the Courſe and Difference of Latitude.



The Operation by Logarithms. *For the Courſe.*

As the Diſtance 247 Minutes— — — —	—2.392697
To the Radius— — — —	—10.000000
So is the Departure 197 Minutes— — —	—2.294465
To the Sine of the Courſe S. 52 deg. 54 min. Weſterly— —	—9.901709

For the Difference of Latitude.

As Radius——— ——— ——— ———10.000000
To the Diſtance 247 Minutes——— ——— ———2.392697
So is the S. c. of the Courſe 37 deg. 6 min.— — —9.780467
To the Difference of Latitude 149 min.——— ——— ———12.173164

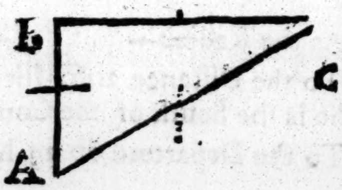
By Gunter.

For the Courſe. The Extent of the Compaſſes from the Diſtance 247 Minutes, to the Departure 197 Minutes, will reach the ſame Way from Radius S. 90 deg. to the Sine of the Courſe 52 deg. 54 min. South Weſterly, or South Weſt three quarters Weſt.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to S. 37 deg. 6 min. the Complement of the Courſe will reach the ſame Way from the Diſtance 247 Minutes to the Difference of Latitude, 149 minutes.

PROB. VI. The Difference of Latitude and Departure given, to find the Courſe and Diſtance.

Suppoſe a Ship ſails between the South and the Weſt, until the Difference of Latitude be 154 Leagues, and her Departure 200 Leagues; required the Courſe and Diſtance.



The Operation by Logarithms. *For the Courſe.*

As the Difference of Latitude 154 Leagues——— ——— ———2.187521
To Radius——— ——— ——— ———10.000000
So is the Departure 200 Leagues——— ——— ———2.301030
To the Tangent of the Courſe 52 deg. 24 min. South Weſterly———10.113509

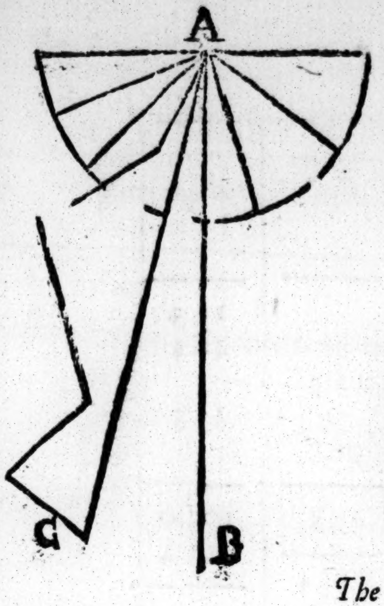
For the Diſtance.

As the S. c. of the Courſe 37 deg. 36 min.— — —9.785433
To the Difference of Latitude 154 Leagues— — —2.187521
So is the Radius——— ——— ——— ———10.000000
To the Diſtance 252.5 Leagues——— ——— ———2.402088

By Gunter.

For the Courſe. The Extent of the Compaſſes from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues will reach from Radius or Tangent of 45 deg. to the Tangent of the Courſe, 52 deg. 24 min. South Weſterly, or South Weſt three quarters Weſt.

For the Diſtance. The Extent from the S. 36 deg. 37 min. the Complement of the Courſe, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Diſtance 252.5 Leagues.



PROB. VII.

This Problem ſhews the manner of working a Traverſe; and is very uſeful in keeping a Reckoning by plane Sailing.

Example.

Suppoſe a Ship bound to a certain Port, and ſails firſt SSW 40 Minutes, then SW 60 min. then S by E 63 min. then WSW 49 min. then SE by S 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance is required.

The Operation by Logarithms.

For the Difference of Latitude for the firſt Courſe.

As Radius— — — — — —10.000000
To the Diſtance 40 Minutes — — — —1.602060
So is the S. c. of the Courſe 67 d. 30 m.— — —9.965615
To the Difference of Latitude 36.95 Minutes— — —11.567675

For the Departure of the firſt Courſe.

As Radius— — — — — —10.000000
To the Diſtance 40 Minutes— — — — —1.602060
So is the S. of the Courſe 22 deg. 30 min.— — —9.582840
To the Departure 15.31 Minutes——— ——— ———11.184900

By Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Diſtance 40 Minutes, that Extent in the Compaſſes laid from the Sine of the Courſe 2 Points will reach to 15.3 Minutes the Departure, and the Compaſſes being kept to the ſame Extent, and laid from the S. 6 Points, the Complement of the Courſe, will reach to 36.9 Minutes the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

The

The Traverſe TABLE.

Courſes.	*Diſtance.*	*North.*	*South.*	*Eaſt.*	*Weſt.*
S. S. W.	40		37.0		15.3
S. W.	60		42.4		42.4
S. by E.	63		61.8	12.3	
W. S. W.	49		18.8		45.3
S. E. by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the Table.

In placing the difference of Latitude and Departure in their proper Columns obſerve, that if the Courſe be Northerly, the difference of Latitude is put in the North Column; if it be Southerly, in the South Column; and if the Courſe be Eaſterly, the Departure, is put in the Eaſt Column, and if Weſterly, in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the difference of Latitude appears to be 206.6 Minutes South, becauſe there is nothing in the North Column; the Departure 59.6 Minutes Weſt, becauſe by ſo much the Weſt Column exceeds the Eaſt: Then by this Difference of Latitude and Departure, find the direct Courſe and Diſtance as follows.

The Operation by the Logarithms. *For the direct Courſe.*

As the difference of Latitude 206.6 min.——— ——— ——— 2.315130
To Radius——— ——— ——— ——— 10.000000
So is the Departure 59.6 m.——— ——— ——— ——— 1.775246
To the T. of the Courſe 16d. 5m. South-Weſterly, becauſe the South and Weſt Columns exceed the North and Eaſt. } 9.460116

For the Diſtance.

As the S. c. of the Courſe 16d. 5m.——— ——— ——— 9.982660
To the difference of Latitude 206.6 m.——— ——— ——— 2.315130
So is Radius——— ——— ——— ——— ——— 10.000000
To the Diſtance required 215 m.——— ——— ——— 2.332470

By Gunter. *For the direct Courſe.*

The Extent of the Compaſſes from the Difference of Latitude 206.6m. to the Departure 59.6m. will reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Courſe required.

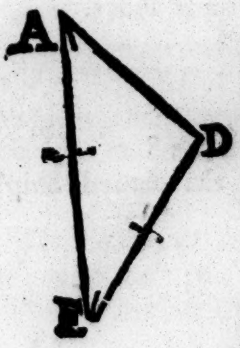
For the Diſtance.

The Extent from the S. 73 deg. 55 min. the Complement of the Courſe, to S. 90d. (*viz.* Radius) will reach from the Difference of Latitude 206.6m. to the Diſtance 215 m.

Oblique angled Plain Triangles, applied in PROBLEMS *of Plane Sailing, and wrought by* Logarithms, *and* Gunter's *Scale.*

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.



Suppoſe there are two Ports both under one Meridian, a Ship ſails from the northermoſt S E. 206 Miles, another Ship ſails from the ſouthermoſt North-Eaſt by North, a certain number of Miles, and meets with the firſt Ship; the Diſtance between theſe two Ports, and the Diſtance ſailed by the ſecond Ship is required.

In the Triangle A D E.

A and E repreſent the two Ports, A D the firſt Ship's Diſtance, E D the ſecond Ship's Diſtance, A E the Diſtance between the two Ports.

The Operation by the Logarithms. *For the Diſtance between the two Ports.*

As S. A E D 33° 45′ ——— ——— ———Co. Ar. 0.255261
To A D the firſt Ship's Diſtance 206 m.——— ——— ———2.313867
So is S. A D E 101° 15′, which ſubſtracted from 180d. — —9.991574
To A E the Diſtance between the two Ports 363.7 m.— — 12.560702

In all Proportions where Radius is not one of the three given Terms, to ſave the Labour of ſubtracting the firſt Logarithm from the Sum of the ſecond and third, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right Hand, which is ſubtracted from 10, as in the Operation, the Logarithm Sine found in the Table, is 9.744739; wherefore beginning at the Left Hand ſay, 9 from 9, there remains 0; 7 from 9, there remains 2; 4 from 9, there remains 5; 4 from 9, remains 5; 7 from 9, there remains 2; 3 from 9, there remains 6; 9 from 10, there remains 1. So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which added to the other two Logarithms, and from that Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90°, ſubtract the Degree and Minute from 180°, the Sine of the Remainder (called the Supplement) is the Sine required.

For the ſecond Ship's Diſtance.

As S. A E D 33° 45′	Co. Ar. 0.255261
To A D the firſt Ship's Diſtance 206′	2.313867
So is S. D A E 45° 00′	9.849485
To D E the ſecond Ship's Diſtance, 262.2 min.	12.418613

By Gunter. *For the Diſtance between the two Ports.*

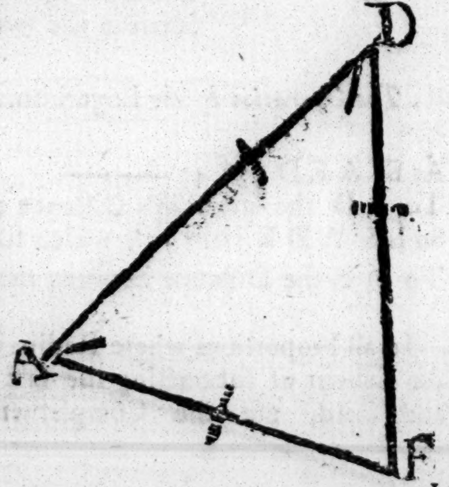
The Extent of the Compaſſes from S. of 33° 45′ to the S. A D E, 78° 45′ (*viz.* the Supplement of 101° 15′ to 180°) will reach from 206′ the firſt Ship's Diſtance, to 363.7′ the Diſtance between the two Ports as above.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33° 45′ to the S. of 45° 00′ will reach from 206′ the firſt Ship's Diſtance, to 262.2′ the ſecond Ship's Diſtance required.

PROB. II.

Two Sides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle, and the third Side.



Example.

Suppoſe two Ports, whoſe bearing is North-Eaſt and South-Weſt, diſtant 396 Miles, a Ship at the Northermoſt ſails S. S. E. and another Ship at the Southermoſt ſails thence, 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ship's Diſtance are required.

In the Triangle A D E.

A repreſents the Southermoſt Port, D the Northermoſt.
A D, the Diſtance between the two Ports.
D E, the Courſe and Diſtance ſailed by the firſt Ship.
A E, the Courſe and Diſtance ſailed by the ſecond Ship.

The Operation by Logarithms. *For the ſecond Ship's Courſe.*

As A E, the ſecond Ship's Diſtance, 518′	Co. Ar.	7.285671
To S. A D E, 67° 30′		9.965615
So is AD, the Diſtance between the two Ports 396′		2.597695
To S. A E D 44° 56′		19.848981

The Angle at D 67° 30′ and the Angle at E 44° 56′ being added together, and ſubtracted from 180° give 67° 34′ the Angle at A, which makes neareſt 6 Points, and 6 Points reckoned from the North-Eaſt to the Southward, gives E S E. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. A D E 67° 30′	Co. Ar.	0.034385
To A E the ſecond Ship's Diſtance 518′		2.714330
So is S. D A E 67° 34′		9.965824
To D E the firſt Ship's Diſtance 518.3′		12.714539

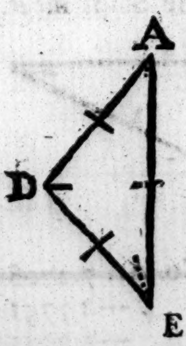
By Gunter. *For the ſecond Ship's Courſe.*

The Extent of the Compaſſes from 518′. to S. 67° 30′ will reach from 396′ to S. 44° 56′, which added to the Angle at D, and the Sum ſubtracted from 180°, gives 67° 34′ the Angle at A, as above.

For the firſt Ship's Diſtance. The Extent from S. 67° 30′ to 518′ will reach from S. 67° 34′ to 518.3′ the Ship's Diſtance, as above.

P R O B. III.

Two Sides and the contained Angle given, to find the other Angles and Side.



Example.

Suppoſe two Ships ſail from one Port; one ſails N E. 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships is required.

Miles.
140
115
———
25

Let D repreſent the Port, D A the firſt Ship's Diſtance, and D E the ſecond.

The Operation by Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides A D and D E 255′	Co. Ar. 7.593460
To the Difference of the ſaid Sides 25′	1.397940
So is the T. of half the Sum of their oppoſite Angles 50° 37′	10.085698
To the T. of half their Difference, which is 6° 48′	19.077098

The half difference added to the half Sum, gives 57° 25′, the greater Angle A E D. The half Difference ſubtracted from it, gives 43° 49′, the leſſer Angle D A E. Wherefore the Bearing of the two Ships is N. Eaſterly, and South Weſterly, 1° 11′.

For the Diſtance of the two Ships.

As S. A E D 57° 25′	Co. Ar. 0.074374
To A D the firſt Ship's Diſtance 140′	2.146128
So is S. A D E 78° 45′	9.991574
To A E the Diſtance of the Ships, 163′	12.212076

By Gunter. *For the Bearing of the two Ships.*

The Extent of the Compaſſes from the Sum of the Sides 255′ to their Difference 25′ will reach from the T. of the half Sum of the required Angles 50° 37′ to the T. of half the Difference of the ſaid Angle 6° 48′.

In this Proportion by *Gunter*, the Practitioner may be at a Loſs, becauſe the Point T. 50° 37′ would fall beyond the T. of 45° was the Tangent Line continued: To remedy which, place the Extent from 255 to 25, from the T. 45° and it will reach to T. 5° 37′, then letting one Point ſtand at 5° 37′, extend the other to the T. 50° 37′, this Extent place from the T. of 45° ſhall fall on the T. 6° 48′ required.

For the Diſtance of the Ships.

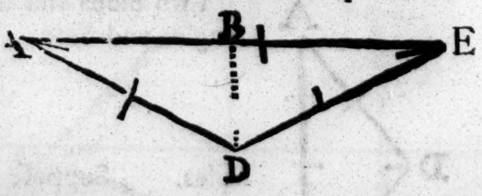
The Extent from the S. of 57° 25′ to the S. of 78° 45′ will reach from 140° to 163′.

PROB. IV. Three Sides being given to find the Angles.

Example. Suppoſe there are two Ports both in one Latitude, diſtant 536 Miles, a Ship ſails from the Eaſtermoſt 306 Miles between the South and the Weſt: Another Ship ſails from the Weſtermoſt 290 Miles, and meets with the firſt Ship. The Courſe that each Ship hath ſteered is required.

Let A and E repreſent the two Ports, D the Place where the Ships meet.

This Queſtion is reſolved by letting fall a Perpendicular D B, reducing the Oblique Triangle A D E, into the two Right-angled Triangles A B D and E B D, then the Operation is as follows:



Firſt, find the Segment of the Baſe B E, thus,

As the Baſe A E 536 Miles — — — —	Co. Ar. 7.270835
To the Sum of the Sides A D and E D, 596 Miles —	—2.775246
So is the Difference of the ſaid Sides 16 Miles— —	—1.204120
To the Diff of the Segments of the Baſe, which is 17.8 Miles	11.250201

The whole Baſe — — 536 min.
The Difference of the Segments is — 17 8
Sum is — — — — 553.8
Half Sum — — — 276.9 the greater Segment B E.

Then ſay, *For the firſt Ship's Courſe.*

As D E the firſt Ship's Diſtance 306′ — — — 2.485721
To Radius — — — — — 10.000000
So is the greateſt Segment B E 276.9′ — — 2.442323
To Sc. B E D 25° 9′ — — — — 9.956602

The Angle at E is the Courſe from the Weſt Southerly, ſo the firſt Ship ſteers South 64° 51′ Weſt, or S. W. by W. three Quarters S. Weſt almoſt.

For the ſecond Ship's Courſe.

As A D the ſecond Ship's Diſtance 290′ ——— Co. Ar. 7 537602
To Sine A E D 25° 9′ ——— ——— ——— 9 628378
So is D E the firſt Ship's Diſtance 306 ——— 2.485721
To Sine D A E 26° 39′ ——— ——— 19.651701

The Angle at A is the Courſe from the Eaſt Southerly, ſo the ſecond Ship ſteers South 63° 21′ Eaſt, or S E by E. 3 Quarters E. nearly.

By Gunter. *For the Difference of the Segments of the Baſe.*

The Extent of the Compaſſes from the Baſe A E 536′ to the Sum of the Sides 596′ will reach from the Difference of the Sides 16, to the Difference of the Segments of the Baſe 17.8, with which proceed as before.

For the Firſt Ship's Courſe.

The Extent from the Diſtance 306′, to the greater Segment 276 9′ will reach from Radius or Sine 90°, to Sine 64° 51′ the Complement of B E D 25° 9′ required.

For the ſecond Ship's Courſe.

The Extent from 290′ the ſecond Ship's Diſtance, to 306′ the firſt Ship's Diſtance, will reach from the Sine 25° 9′ to the Sine 26° 39′ the Angle at A required.

PROB. V.

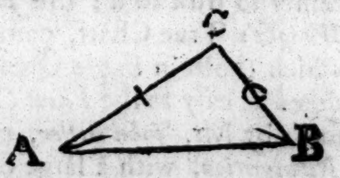
Two Sides and their contained Angle given, to find the Third Side.

Example.

Two Ships ſail from one Port at A; the firſt ſails Eaſt 335 Miles to B. the ſecond ſails Eaſt 14° 40′ North, 271 Miles to C; I demand how far they are aſunder, and what is the Courſe from the Ship at C, to that at B?

In the Triangle A B C,
there is given,

A B 335
A C 271 } B C required
B A C 14° 40′



This Caſe requires a double operation ; — — AB 335
1. By the third Caſe to find the Angles. — — AC 271
2. By the firſt Caſe, to find the Side required. — — Sum is 606
Diſt. is 64

The firſt Operation.

As the Sum of the Sides AB and AC	606 Miles	Co. Ar.	7.217527
To their Difference	64		1.806180
So is the T. half Sum of the Angles	82° 40′		10.890441
To T. half their Difference	39° 22′		19.914148

By which you will find the Angle ABC, to be 43° 18′.

The ſecond Operation.

As S. ABC 43° 18′	Co. Ar.	0.163791
To the Side AC 271 Miles		2.432969
So is S. BAC 14°. 40′		9.403455
To the Side BC 100 Miles		12.000215

The Angle at B is found to be 43° 18′, and the Line AB lying Eaſt and Weſt, the Courſe from C to B is Eaſt 43° 18′ South, or South Eaſt 1° 42′ Eaſterly. and the Diſtance 100 Miles.

By Gunter. *For the Angle at* B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the Sides, will reach from the Tangent of 82° 40′ half the Sum of the unknown Angles ; to the Tangent of 39° 22′ half their Difference. Which being found, proceed according to former Directions, to find the Angle at B.

Then the Extent from S. 43° 18′ the Angle at B, to S. 14° 40′ the Angle at A ; will reach from 271 Miles the Side AC, to 100 Miles, the Side BC, as above.

Thus much for ſailing by the *Plane Chart*, which being of ſome Uſe in ſhort Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit ; but nevertheleſs would adviſe all that take Charge of Ships never to content themſelves with the Uſe of the *Plane Chart* only, being ſo apparently falſe in itſelf, and ſo unſafe for Practice : Nor are we under any Neceſſity to truſt to it ; the Defect thereof being now ſufficiently ſupplied by Mr. *Wright*'s True Chart, commonly called *Mercator*'s, the Projection and Uſe of which (both in ſingle Queſtions and Traverſes) are largely treated of and rendered as eaſy as the *Plane Chart*, in the Book called *Practical Navigation*, firſt ſet forth by Mr. *John Seller*, as alſo by the New Edition of *Atkinſon's Epitome of Navigation*, with a large Supplement by *H. Wilſon*, and now Corrected and both Reprinted for *Jane Grierſon*, at the Corner of *Caſtle-Lane* in *Dame-Street*, with many uſeful Additions.

IF the two Places differ only in Latitude, then are they both under one and the ſame Meridian: And to know the Diſtance betwixt them in Miles or Leagues, multiply the Number of the Degrees of Difference by 60 Miles, or 20 Leagues, the Product of which Multiplication, gives the true Diſtance between them in Miles or Leagues, according as you work them, being that 60 Miles or 20 Leagues make 1 Degree of a great Circle: But if the one Place have North Latitude, and the other South, then add both their Latitudes together, and work as aforeſaid: and if both the Places are under the equinoctial, they have then no Latitude. And there likewiſe 60 Miles or 20 Leagues make 1 Degree, and the working like the former, if the Difference be under 180 Degrees: For if the Difference be more than 180, ſubtract the ſaid Difference from 360, and multiply the Remainder by 60 or 20, as before.

Theſe are ſo plain and eaſy, that they need no Example: But if they differ both in Longitude and Latitude, or in Longitude only in that Parallel beſide the Equinoctial, the working is ſomewhat more difficult, by reaſon that the further the Parallels are diſtant from the Equinoctial towards either of the Poles, the ſhorter they are; and the ſhorter the Parallels are, the fewer Miles make a Degree; ſo that whereas in the Equinoctial 60 Miles make 1 Degree, yet in Longitude, where the Pole is raiſed about 52 Degrees, in this Parallel 37 Miles make a Degree, and ſo every 37 Miles Eaſt or Weſt in this Parallel, are ſo many Degrees. For which Purpoſe, I have here added a new Table, ſhewing the Miles of Diſtance anſwerable to a Degree in every ſeveral Latitude from the Equinoctial towards either of the Poles. And when you know the Miles anſwerable to a Degree in the Parallel deſired, if the Difference of the two Places be only in Longitude, multiply the Difference of their Longitude by the Number of Miles anſwerable to a Degree, and the Product ſheweth the Diſtance in *Engliſh* or *Italian* Miles betwixt the ſaid two Places.

Latit.	Miles and 100 Parts in a Degr.		Latit.	Miles and 100 Parts in a Degr.	
	M.	Pts.		M.	Pts.
1	59	99	46	41	68
2	59	96	47	40	92
3	59	92	48	40	15
4	59	85	49	29	36
5	59	77	50	28	57
6	59	67	51	27	76
7	59	55	52	36	94
8	59	42	53	36	11
9	59	26	54	35	27
10	59	09	55	34	41
11	58	91	56	33	55
12	58	69	57	32	68
13	58	46	58	30	80
14	58	22	59	30	90
15	57	96	60	29	00
16	57	67	61	28	09
17	57	38	62	27	17
18	57	06	63	26	24
19	56	73	64	25	30
20	56	38	65	24	36
21	56	01	66	23	20
22	55	62	67	22	44
23	55	23	68	21	07
24	54	81	69	20	50
25	53	38	70	19	52
26	53	93	71	18	53
27	53	46	72	17	54
28	52	98	73	16	54
29	52	48	74	15	54
30	51	96	75	14	53
31	51	43	76	13	51
32	50	88	77	12	50
33	50	32	78	11	47
34	59	74	79	10	45
35	59	15	80	09	42
36	58	54	81	08	38
37	57	92	82	07	35
38	57	28	83	06	31
39	56	63	84	05	27
40	45	90	85	04	23
41	45	28	86	03	18
42	44	59	87	02	14
43	43	88	88	01	09
44	43	16	89	00	05
45	42	43	90	00	00

Example.

London and *Middleburgh* have both in a Manner one Latitude (*viz.*) about 52 Degrees, and I find in this Table that in the Parallel of 52 Degrees, 36 Miles, 84 Parts make a Degree of Longitude, the Longitude of *London* is 25 Degrees, 50 Minutes, which ſubtracted one from another, leave 3 Degrees, 50 Minutes for the Difference of Longitude. Then multiplying 3 Degrees by 37 Miles, the Product is 111 Miles: Then for 50 Minutes. I ſay by the Rule of Three, If 60 Minutes give 37 Miles, what give 50 Minutes? *Facit* near 31, which added to 111, makes 142 Miles, or 47 Leagues and a Mile, for the Diſtance betwixt *London* and *Middleburgh*.

But if the two Places differ both in Longitude and Latitude, then is the Working more difficult than either of the former. For firſt, you muſt take the Difference of the two Places in Longitude, and then their Difference alſo in Latitude: Then multiply the Difference of Latitude of the two Places by 60, and ſet the Product thereof by itſelf for the firſt Number: Then multiply the Difference of Longitude by the Number of Miles anſwerable to each Latitude ſeverally, and add both the Products together: The half whereof ſet down for your ſecond Number, and multiplying each of the ſaid two Numbers into itſelf ſquarely, add both the Products together, and extracting the Square Root thereof, the ſaid Square Root is the Diſtance between the two Places deſired.

A TABLE,

A TABLE, ſhewing how many Leagues, Miles, and hundred Parts of a Mile, make one Degree of Longitude in any Latitude.

Latitude	Leagues	Miles	Parts.	Differ.	Latitude	Leagues	Miles	Parts.	Differ.	Latitude	Leagues	Miles	Parts.	Differ.
0	20	0	00	—	30	17	0	96	—	60	10	0	0	—
1	19	2	99	1	31	17	0	43	53	61	9	2	9	91
2	19	2	96	3	32	16	2	88	55	62	9	1	17	92
3	19	2	92	4	33	16	2	32	56	63	9	0	24	93
4	19	2	85	7	34	16	1	74	58	64	8	2	30	94
5	19	2	77	8	35	16	1	15	59	65	8	1	36	94
6	19	2	67	10	36	16	0	54	61	66	8	0	40	96
7	19	2	55	12	37	15	2	92	62	67	7	2	44	96
8	19	2	42	13	38	15	2	28	64	68	7	1	47	97
9	19	2	26	16	39	15	1	63	65	69	7	0	50	97
10	19	2	09	17	40	15	0	96	67	70	6	2	52	98
11	19	1	90	19	41	15	0	28	68	71	6	1	53	99
12	19	1	69	21	42	14	2	59	69	72	6	0	54	99
13	19	1	46	23	43	14	1	88	71	73	5	2	54	100
14	19	1	22	24	44	14	1	16	72	74	5	1	54	100
15	19	0	96	26	45	14	0	43	73	75	5	0	53	101
16	19	0	68	28	46	13	2	68	75	76	4	2	52	101
17	19	0	38	30	47	13	1	92	76	77	4	1	50	102
18	19	0	06	32	48	13	1	15	77	78	4	0	48	102
19	18	2	73	33	49	13	0	36	78	79	3	2	45	103
20	18	2	38	35	50	12	2	57	79	80	3	1	42	103
21	18	2	01	37	51	12	1	76	81	81	3	0	38	104
22	18	1	63	38	52	12	0	94	82	82	2	2	35	104
23	18	1	23	40	53	12	0	13	83	83	2	1	31	104
24	18	0	81	42	54	11	2	27	84	84	2	0	27	104
25	18	0	38	43	55	11	1	41	86	85	1	2	23	104
26	17	2	93	45	56	11	0	55	86	86	1	1	18	104
27	17	2	46	47	57	10	2	68	87	87	1	0	14	104
28	17	1	98	48	58	10	1	80	88	88	0	2	09	104
29	17	1	84	50	59	10	0	90	90	89	0	1	05	104
30	17	0	96	00	60	10	0	00	00	90	0	0	00	00

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	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.4	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	17.9	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	18.9	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	19.9	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	31.9	01.6	31.9	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	32.9	01.6	32.9	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	33.9	01.7	33.9	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	34.9	01.7	34.9	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	35.9	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.7	37.0	01.3	36.9	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	37.9	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	38.9	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	39.9	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	40.9	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.2	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.3	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.8	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.8	49.9	02.4	49.9	02.6	49.9	03.5	49.8	04.4	50
Diſt.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	89 Deg.		88 Deg.		7¾ Point		87 Deg.		86 Deg.		85 Deg.		

Diſt.	1 Deg.		11 Deg.		¼ Point.		3 Deg.		4 Deg.		5 Deg.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.5	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.6	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.9	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.8	04.1	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.8	04.1	58.8	05.2	59
60	60.0	01.0	60.0	02.1	59.9	02.9	59.9	03.1	59.8	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60,8	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.3	61.8	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.4	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.7	05.7	65
66	66.0	01.1	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.9	67
68	68.0	01.2	67.9	02.4	67.9	03.3	67.9	03.6	67.8	04.8	67.7	05.9	68
69	69.0	01.2	68.9	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	69.9	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	70.9	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	71.9	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	72.9	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	73.9	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	74.9	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.6	75
76	76.0	01.3	75.9	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	76.9	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.3	77.9	02.7	77.9	03.8	77.9	04.1	77.8	05.5	77.7	06.8	78
79	79.0	01.4	78.9	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.8	06.9	79
80	80.0	01.4	79.9	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	80.9	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.4	82.9	02.9	82.9	04.1	82.9	04.4	82.8	05.8	82.7	07.3	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.5	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04,6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.2	87.7	07.7	88
89	89.0	01.5	88.9	03.0	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.0	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.9	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	08.0	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.6	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.9	97.6	08.6	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.7	99
100	100.	01.7	99.0	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	89 Deg.		88 Deg.		7 Point.		87 Deg.		88 Deg.		85 Deg.		

Diſt.	½ Point.		6 Deg.		7 Deg.		8 Deg.		¾ Point.		9 Deg.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	04.9	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.8	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.2	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.5	9
10	09.9	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.2	11.9	01.5	11.9	01.7	11.9	01.8	11.8	01.9	12
13	12.9	01.3	12.9	01.3	12.9	01.6	12.8	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.4	13.9	01.7	13.8	01.9	13.9	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.5	14.9	01.8	14.8	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.7	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.2	22.9	02.4	22.8	02.8	22.8	03.2	22.7	03.4	22.7	03.6	23
24	23.9	02.3	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.7	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.6	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.2	28.6	04.5	29
30	29.8	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.4	31.6	04.7	31.6	05.0	32
33	32.8	03.2	32.8	03.4	32.7	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.5	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.3	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.5	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	06.0	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.7	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.7	04.7	44.7	05.5	44.6	06.2	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.5	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.5	46.5	07.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	½ Point.		84 Deg.		83 Deg.		82 Deg.		¾ Point.		81 Deg.		

Dist.	½ Point.		6 Deg.		7 Deg.		8 Deg.		¾ Point.		9 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50.7	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.4	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.6	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.8	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.7	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.3	59.3	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.6	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.6	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.1	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.2	10.1	68.1	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.6	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.6	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.1	72.6	07.6	72.4	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.2	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.2	10.7	76.2	11.3	76.0	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.1	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.5	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.5	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.3	84.2	11.8	84.1	12.5	83.9	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.4	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.5	86.1	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.9	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.4	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.8	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.0	13.5	95.9	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	12.0	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.5	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	7 ½ Point.		84 Deg.		83 Deg.		82 Deg.		7 ¼ Point.		81 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point.		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.9	00.4	01.9	00.4	01.9	00.5	2
3	02.9	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.1	04.8	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.8	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.9	01.7	09.8	01.9	09.8	01.9	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.5	03.6	15
16	15.7	02.8	15.7	03.0	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	02.9	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.2	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.4	05.2	24.3	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.1	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.4	28.5	05.5	28.5	05.7	28.4	06.0	28.2	06.5	28.1	07.0	29
30	29.5	05.4	29.4	05.7	29.5	05.8	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.5	31.4	06.1	31.4	06.2	31.3	06.6	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.1	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.2	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	01.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.0	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.2	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.7	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.8	41.9	09.7	41.7	10.4	43
44	43.3	07.7	43.2	08.4	43.1	08.6	43.0	09.9	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	11.0	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.1	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.7	10.8	46.5	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.3	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	80 Deg.		79 Deg.		7 Point.		78 Deg.		77 Deg.		76 Deg.		

Diſt.	10 Deg.		11 Deg.		1 Point.		12 Deg.		13 Deg.		14 Deg.		Diſt.
	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	50.2	08.8	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	05.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.8	54.9	10.9	54.8	11.6	54.5	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.4	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.2	57.0	11.4	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.1	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	14.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	11.0	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.2	62.8	12.2	62.8	12.5	62.6	13.3	62.3	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.7	12.7	63.6	13.5	63.3	14.6	62.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.2	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.5	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.1	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.6	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.0	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.4	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.6	19.2	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	77.9	18.0	77.6	19.3	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.4	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.2	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.2	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.2	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.2	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.5	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.1	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
Diſt.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	80 Deg.		79 Deg.		7 Point.		78 Deg.		77 Deg.		76 Deg.		

Diſt.	1¼ Point.		15 Deg.		16 Deg.		1½ Point.		17 Deg.		18 Deg.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	00.9	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.8	00.9	3
4	03.9	00.4	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	00.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.7	01.6	05.8	01.7	05.7	01.7	05.7	01.8	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.6	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.8	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.[illegible]	04.[illegible]	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	04.0	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.2	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.5	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	[illegible]	20.1	06.1	20.0	06.5	21
22	21.4	05.3	21.2	05.7	21.1	06.1	21.0	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	06.8	22.9	07.0	22.8	07.4	24
25	24.2	06.0	24.1	06.[illegible]	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	24.9	07.2	24.9	07.5	24.8	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	25.9	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.1	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.6	28
29	28.1	07.0	28.0	07.[illegible]	27.8	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.9	30.9	08.3	30.7	08.8	30.6	09.3	30.6	09.3	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.0	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.3	38.4	11.0	38.3	11.6	38.2	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	12.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.5	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.2	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.3	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	12.9	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.2	13.2	45.9	13.9	45.9	14.0	45.6	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	11.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.5	15.4	50
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	6¾ Point.		75 Deg.		74 Deg.		6½ Point.		73 Deg.		72 Deg.		

Diſt.	1¼ Point		15 Deg.		16 Deg.		1½ Point.		17 Deg.		18 Deg.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	49.5	12.4	49.3	13.2	49.0	14.0	48.8	14.8	48.8	14.9	48.5	[illegible]	51
52	50.4	12.6	50.2	13.5	49.1	14.3	49.7	15.1	49.7	15.2	49.[illegible]	[illegible]	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	3
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	4
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.5	13.8	55.1	14.8	54.8	15.7	54.5	16.5	54.4	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.7	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.2	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.1	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.8	16.3	60.5	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.5	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.1	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.4	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.2	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.2	68.6	18.3	68.2	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.0	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.8	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.1	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.0	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.3	73.6	22.5	73.2	23.8	77
78	75.7	18.9	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	25.3	77.5	23.5	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.3	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.8	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.3	21.1	84.0	22.5	83.6	24.0	83.3	25.2	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.2	84.2	25.5	84.1	25.7	83.7	27.2	88
89	86.4	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.3	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.2	29.3	95
96	93.1	23.3	92.7	24.8	92.3	26.4	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.6	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	6¾ Point.		75 Deg.		47 Deg.		6½ Point.		73 Deg.		72 Deg.		

Dist.	19 Deg.		1¾ Point.		20 Deg.		21 Deg.		22 Deg.		2 Points.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.6	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.7	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.8	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	01.9	05.6	02.0	05.6	02.0	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	00.4	03.4	09.4	03.4	09.3	03.6	09.2	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.0	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.4	14.9	05.8	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.3	16.8	06.4	16.7	06.7	16.6	06.8	18
19	18.0	06.1	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.9	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.6	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.5	08.2	22.4	08.6	22.2	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.5	09.2	25.2	09.7	25.0	10.1	24.9	10.3	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.2	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.7	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.0	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.1	11.5	29.7	12.0	29.6	12.2	32
33	31.2	10.7	31.1	11.1	31.1	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.4	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.2	13.5	33.3	13.8	36
37	35.0	12.1	34.8	12.5	34.8	12.6	34.5	13.3	34.1	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.0	14.2	35.1	14.3	38
39	36.9	12.0	36.7	13.1	36.6	13.3	36.4	14.0	36.8	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.9	15.9	36.9	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.3	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.6	16.8	44
45	42.6	14.6	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.8	41.6	17.2	45
46	43.5	15.0	43.3	15.	43.2	15.7	42.9	16.5	42.6	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.7	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.1	44.5	18.0	44.3	18.4	48
49	46.3	15.9	46.1	16.	46.0	16.8	45.7	17.5	45.4	18.3	45.3	18.7	49
50	47.3	16.3	47.1	[illegible]	47.0	17.1	46.7	17.9	46.4	18.7	40.2	19.1	50
Dist.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg		6 Points.		

Diſt.	19 Deg.		1¾ Point.		20 Deg.		21 Deg.		22 Deg.		2 Points.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.4	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.8	49.0	20.3	53
54	51.1	17.6	50.8	18.2	50.7	18.5	50.4	19.3	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.9	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.3	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.1	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.5	57.3	20.9	56.9	21.9	56.5	22.8	56.3	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.0	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.6	61.1	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.5	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.3	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.2	67.7	24.6	67.2	25.8	66.7	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.1	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	70.9	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	27.9	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.7	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	26.9	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.5	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	76.9	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.1	28.6	79.9	29.1	79.3	30.5	78.8	31.8	78.6	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.2	30.8	79.7	32.2	79.4	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.7	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.6	82.8	29.6	82.7	30.1	82.1	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.1	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	84.9	32.6	84.4	34.1	84.1	34.8	91
92	87.0	29.9	86.6	31.0	86.4	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	88.0	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.7	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.3	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	35.9	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.5	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.3	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	71 Deg.		6¼ Point.		70 Deg.		69 Deg.		68 Deg.		6 Point.		

Dist.	23 Deg.		24 Deg.		25 Deg.		2 Point.		26 Deg.		27 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.7	03.6	01.8	4
5	04.6	01.9	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.2	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.3	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.7	05.6	11.7	05.7	11.6	05.8	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	05.9	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	00.6	14.4	07.0	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.4	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.4	18.1	08.5	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.4	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.2	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.9	19.6	10.0	22
23	21.2	09.0	21.0	09.3	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.7	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.7	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.8	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.1	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.4	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.7	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.4	33.8	15.1	33.5	15.6	33.4	15.8	33.2	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.0	34.3	16.2	34.1	16.6	33.9	17.2	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.0	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.2	16.9	36.2	17.1	35.9	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.8	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.2	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.6	44.5	22.7	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	67 Deg.		66 Deg.		65 Deg.		5¾ Point.		64 Deg.		63 Deg.		

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point.		26 Deg.		27 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	46.9	19.9	46.6	20.7	46.2	21.5	46.1	21.8	45.8	22.3	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.4	48.4	21.5	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.7	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.0	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.6	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	56.9	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.0	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.7	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.2	32.2	71
72	66.3	28.1	65.8	29.3	65.2	30.4	65.1	30.8	64.6	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.7	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.3	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.7	68.6	35.0	77
78	71.8	30.5	71.2	31.7	70.7	33.0	70.5	33.3	70.0	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.1	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.1	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.8	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.2	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.7	37.2	79.5	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.4	80.2	40.9	90
91	83.7	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.8	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.4	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.2	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.3	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.0	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.1	39.1	91.4	40.7	90.6	42.3	90.4	42.7	89.9	43.8	89.1	45.4	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	57 Deg.		66 Deg.		65 Deg		5¾ Point.		64 Deg.		63 Deg.		

Diſt.	28 Deg.		2½ Point.		29 Deg.		30 Deg.		2¾ Points.		31 Deg.		Diſt.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	02.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.1	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.6	09.4	05.7	11
12	10.6	05.6	10.6	05.6	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.4	14.0	07.7	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.4	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.2	15.4	09.3	18
19	16.8	08.9	16.8	08.9	16.6	09.2	16.3	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.4	10.0	17.1	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.3	19.2	10.7	19.0	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.4	24
25	22.1	11.7	22.0	11.8	22.9	12.1	21.6	12.5	21.4	12.8	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.1	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.0	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.5	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.2	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.5	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.5	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.1	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.4	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.0	33.5	17.9	33.2	18.4	32.9	19.0	32.5	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.1	19.3	35.8	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.1	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.6	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.6	44
45	39.7	21.1	39.7	21.2	39.3	21.8	39.0	22.5	38.6	23.1	38.6	23.1	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.1	43.2	23.2	42.8	23.7	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.6	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Diſt.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Diſt.
	62 Deg.		5½ Point.		61 Deg.		60 Deg.		5½ Point.		59 Deg.		

Dist.	28 Deg.		2½ Point.		29 Deg.		30 Deg.		2¾ Point.		31 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.3	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.6	47.5	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.4	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.8	27.6	49.2	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.1	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.0	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.7	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.5	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.4	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.0	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.8	32.5	60.3	33.4	59.7	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.3	36.0	61.8	37.0	61.7	37.1	72
73	64.4	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.1	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.5	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.3	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.7	70.9	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.1	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.5	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	41.9	77.8	43.1	77.1	45.5	76.3	45.8	76.3	45.8	89
90	79.5	42.2	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.2	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.6	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	
Dist.	62 Deg.		5½ Point.		61 Deg.		60 Deg.		5 Point.		59 Deg.		Dist.

Dist.	32 Deg.		33 Deg.		3 Point.		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	
1	00.8	00.5	00.8	00.5	00.8	00.0	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.9	01.7	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.3	4
5	04.2	02.6	04.3	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.4	04.9	03.4	04.8	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.0	04.4	06.6	04.5	06.5	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.1	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.4	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.7	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	15.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.7	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.6	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.0	12.8	18.8	13.2	18.6	13.5	23
24	20.3	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.7	13.9	20.7	14.0	20.5	14.3	20.1	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.5	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.6	14.8	23.5	15.2	23.3	15.5	23.2	15.6	22.9	16.1	22.6	16.5	28
29	24.7	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	20.2	18.3	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.4	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.1	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.7	20.6	39.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	2 .7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.3	31.5	22.9	39
40	33.9	21.2	33.5	21.8	33.3	21.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.7	23.9	35.6	24.0	35.2	24.6	34.8	25.3	43
44	37.3	23.3	36.9	24.0	30.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.1	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.4	45
46	39.0	24.4	38.6	25.0	38.2	25.5	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.1	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.6	38.8	28.2	48
49	41.5	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.2	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.8	40.4	29.4	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	58 Deg.		57 Deg.		5 Point.		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg.		33 Deg.		3 Point.		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	48.0	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.9	32.7	49.9	33.3	49.7	33.5	49.1	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	34.9	49.2	35.9	61
62	52.6	32.8	52.0	33.8	51.5	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.5	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.3	37.3	52.6	38.2	65
66	56.0	35.0	55.3	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.2	40.1	56.6	41.1	70
71	60.3	37.6	59.6	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.3	41.7	71
72	61.0	38.1	60.4	39.2	59.8	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.7	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.0	44.1	75
76	64.4	40.3	63.8	41.5	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.0	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.8	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.5	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	68.0	44.1	67.3	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.5	68.0	45.8	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.8	70.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.3	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	72.9	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.7	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.4	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.2	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.4	75.2	54.7	93
94	79.7	49.8	78.9	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.2	94
95	80.6	50.3	79.7	51.7	79.1	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.6	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.1	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.1	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.5	80.9	58.8	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	58 Deg.		57 Deg.		5 Point.		56 Deg.		55 Deg.		54 Deg.		

Dist.	3¼ Point.		37 Deg.		38 Deg.		39 Deg.		3½ Point.		40 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.3	01.6	01.2	01.6	01.2	01.5	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.1	02.5	03.1	02.5	03.0	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	04.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.9	04.7	03.7	04.6	03.9	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.4	07.4	09.3	07.5	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.6	09.4	11.6	09.5	11.5	09.6	15
16	12.8	09.5	12.8	09.6	12.6	09.8	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.6	10.1	13.6	10.2	13.4	10.5	13.1	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	13.9	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.0	14.5	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.2	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.8	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.0	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.5	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.7	21.0	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.4	22.8	17.8	22.1	18.3	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.0	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.6	24.4	19.0	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.2	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.8	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.2	27.1	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	27.9	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.0	27.7	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.0	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	26.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	29.0	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	30.3	29.8	36.0	30.2	47
48	38.5	28.6	38.3	28.9	37.8	29.5	37.8	30.2	37.1	30.4	36.8	30.9	48
49	39.3	29.2	39.1	29.5	38.6	30.2	38.[illegible]	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	4¾ Points.		53 Deg.		52 Deg.		51 Deg.		4½ Point.		50 Deg.		

Dist.	3¼ Point.		37 Deg.		38 Deg		39 Deg.		3½ Point.		40 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.3	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.3	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.5	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.3	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	33.9	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.8	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.5	47.4	38.4	47.1	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.2	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.1	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.0	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.4	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	55.9	45.3	55.7	45.7	55.1	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.2	46.2	58.3	47.2	58.0	47.6	57.4	48.2	75
76	61.0	45.3	60.7	45.7	60.0	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.7	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.2	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.7	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.4	52.2	64.2	52.6	63.6	53.4	83
84	67.5	50.0	67.1	50.5	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.1	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.7	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.8	67.2	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.6	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.6	56.6	69.6	57.1	68.9	57.4	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.4	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.8	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.5	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.3	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.7	62.2	75.2	63.0	98
99	79.5	59.0	79.1	59.6	78.0	60.9	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	
Dist.	4¾ Point.		53 Deg.		52 Deg.		51 Deg.		4½ Point.		50 Deg.		Dist.

Dist.	41 Deg.		42 Deg.		3¾ Points.		43 Deg.		44 Deg.		4 Points.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	
1	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	02.9	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.6	03.4	03.6	03.5	03.5	03.3	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.3	05.9	05.4	05.8	05.5	05.7	05.6	05.7	05.7	8
9	06.8	05.9	00.7	06.0	06.7	06.0	06.6	06.1	06.5	06.2	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.1	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.1	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.1	12.6	11.4	12.6	11.4	12.4	11.6	12.3	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.0	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.5	15.5	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.5	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.5	19.3	17.4	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.4	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.6	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.6	24.5	22.1	24.4	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.6	22.3	25.3	22.7	25.2	22.8	24.8	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	20.7	24.1	26.7	24.2	26.3	24.5	25.9	25.0	25.4	25.4	36
37	27.9	24.3	27.5	24.7	27.4	24.8	27.0	25.2	26.6	25.7	26.1	26.1	37
38	28.7	24.9	28.2	25.4	28.1	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.0	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.2	27.3	28.8	27.8	28.3	28.3	40
41	31.0	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.5	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	31.9	28.8	31.9	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	31.6	31.1	31.1	44
45	34.0	29.2	33.4	30.1	33.3	30.2	32.9	30.7	32.3	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	30.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.3	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.9	33.6	36.6	34.1	36.0	34.7	35.4	35.3	50
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	49 Deg.		48 Deg		4¼ Point.		47 Deg.		46 Deg.		4 Points.		

Dist.	41 Deg.		42 Deg.		3¾ Point.		43 Deg.		44 Deg.		4 Point.		Dist.
	Lat.	Dep.	Lat	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	
51	38.5	33.5	37.9	34.1	37.8	34.2	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	24.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.0	40.9	36.8	40.7	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	38.9	42.4	39.5	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.1	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.8	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.7	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.6	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.5	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.6	47.5	44.3	46.8	45.1	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	40.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.2	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.3	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.3	48.3	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.9	48.5	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.8	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.1	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.8	58.5	53.0	57.8	53.9	56.8	54.9	55.6	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.0	56.9	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	61.0	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	50.6	59.7	57.6	58.7	59.7	83
84	63.4	55.1	62.4	56.2	62.2	50.4	61.4	57.3	60.4	58.3	59.4	59.4	84
85	64.2	55.9	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.7	63.0	58.6	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.7	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.5	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.0	68.2	61.8	67.3	62.7	66.2	63.9	65.0	65.0	92
93	70.2	61.0	69.1	62.2	68.9	62.4	68.0	63.4	66.9	64.6	65.8	65.8	93
94	71.0	61.7	69.9	62.9	69.6	63.1	68.7	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.4	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.1	69.8	67.6	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.1	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	49 Deg.		48 Deg.		4¼ Point.		47 Deg.		40 Deg.		4 Point.		

The Uſe and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this Nature, yet extant, giving the Difference of Latitude and Departure, to any Diſtance not exceeding 100, in Minutes and Tenth Parts to every Degree and Quarter Point of the Compaſs; and may be uſed to greater Diſtance, being taken out at twice or thrice, according to the Quantity of the Diſtance, as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Degree and Quarter Point of the Compaſs; at the Head it begins at one Deg. ſo 2 Deg. $\frac{1}{4}$ Point, *&c.* encreaſing to 45 Deg. or 4 Points. At the Foot it begins at 45 or 4 Points, ſo 46 Deg. 47 Deg. 4$\frac{1}{4}$ Points, *&c.* encreaſing backwards to 90 Deg. or 8 Points, the Diſtance ſtands in the two outmoſt Columns, under the Title *Diſt.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51 and runs to 100, the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The Uſe of the Table.

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe.*

Example 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſails NNE $\frac{1}{4}$ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right-hand Page, (becauſe the Diſtance is above 50) and at the Top (becauſe it is under 4 Points) look for 2$\frac{1}{4}$ Points, which is the Courſe; under which, and againſt 95 the Diſtance, and under the Title *Lat.* ſtands 81.5. which is 81 min. $\frac{5}{10}$ the Difference of Latit. and under the Title *Dep.* ſtands 48.8. which is 48 min. $\frac{8}{10}$ which is the Departure required.

Examp. 2. Suppoſe a Ship ſails South 56 Deg. Weſterly 48 Miles, the Difference of Latitude and Departure.

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the Bottom (becauſe it is above 45 Deg.) look for 56 Deg. the Courſe; over which and againſt 48 the Diſtance, over the Title *Lat.* ſtands 26.8, that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title Dep. ſtands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required.

Examp. 3. Suppoſe a Ship ſail North Weſt by North 160 Miles, and the Difference of Latitude and Departure required by the Table.

On the Right-hand Page at the Top, look for 3 Points the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Dep.* ſtands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Lat.* ſtands 55.6, that is 55 min. $\frac{6}{10}$ the Departure; then for 60 under 3 Points and againſt 60, under the Title *Lat.* ſtands 49.9, that is 49 min. $\frac{9}{10}$ the Diff. of Latitude, and under the Title *Dep.* ſtands 33.3, that is 33 min. $\frac{3}{10}$ the Departure, then add the Difference of Latitude and Departure for 60 to the Difference of Latitude and Departure for 100, and the Sum is 133 min. the Difference of Latitude and 88 $\frac{9}{10}$ the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plain Sailing*, which for Brevity ſake are omitted here, being taught at large in the laſt Edition of *Practical Navigation*; but the general Uſe of it is in the exact working of a Traverſe.

Examp. 1. Suppoſe a Ship bound to a certain Port, ſails SE. by South, 40 min. then ESE ½ E. 52 min, then E. by N. ½ E. 62 min. then SSW ½ W. 57 min. then South ½ Eaſt 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Leeway, if any; then proceed to look out the Difference of Lat. and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) if the Courſe be Northerly the Difference of Latitude muſt be put in the North Column; if Southerly in the South Column; if the Departure be Eaſterly, it muſt be put in the Eaſt Column; if Weſterly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The Table.

Courſes.	*Diſtance.*	*Diff.*	*Lat.*	*Departure.*	
		North.	*South.*	*Eaſt.*	*Weſt.*
S. E. by S.	49		40. 7	27. 2	
E. S. E. ½ E.	52		15. 1	49. 7	
E. by N. ½ E.	62	06. 1		61. 7	
S. S. W. ½ W.	57		50. 3		26. 9
S. ½ E.	39		38. 8	03. 8	
		06. 1	144. 9	142. 4	26. 9
			0. 1	26. 9	
			138. 8	115. 5	

The whole Diff. of Latitude is 138 $\frac{8}{10}$ S. the Departure 115 $\frac{5}{10}$ E. then to find the Courſe and Diſt. find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* Half the Diff. of Lat. 69.4, and half the Dep. 57.7, the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table, is 69.6 and 57.1 over which, at the Top I find 3 ½ Points, for the Courſe South Eaſterly, or SE ½ S. and in the Column of *Diſt.* 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Examp. 2. The Courſes being given in Degrees which often happens by reaſon of Allowance for the Variation of the Compaſs, and in the like Caſes.

Suppoſe a Ship bound to a certain port, ſails 65 Miles North, 34 Deg. Weſterly. Then 56 Miles North, 67 Degrees Weſterly. Then 48 Miles South, 78 Degrees Weſterly. Then 54 Miles North, 23 Degrees Eaſterly. Then 36 Miles North, 6 Degrees Eaſterly, and the Difference of Latitude and Departure required.

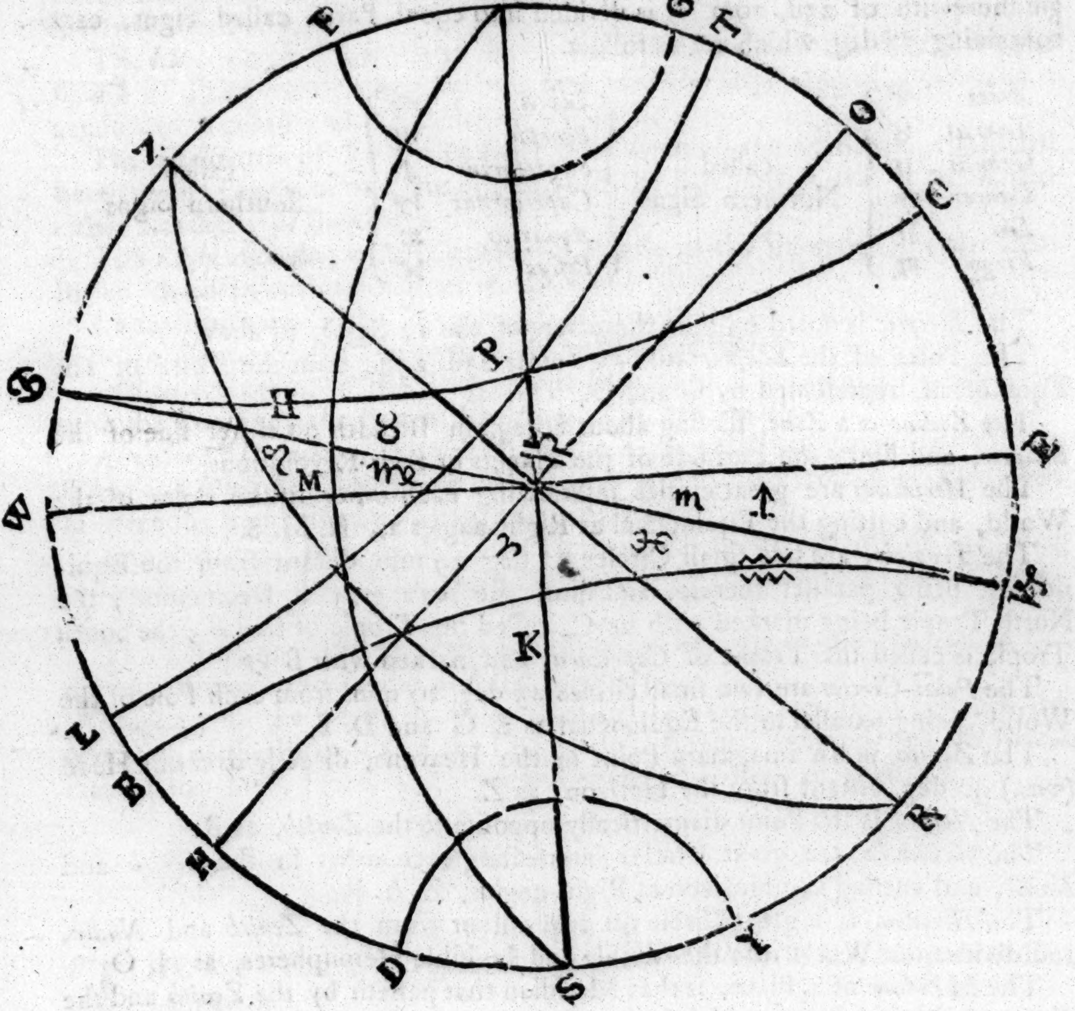
The Table.

Courſes.	*Difference.*	*Diff. of Lat.*		*Departure.*	
		North.	*South.*	*Eaſt.*	*Weſt.*
N. W. 34°	65	53. 9			36. 3
N. W. 67°	56	21. 9			51. 5
S. W. 78°	48		10. 0		47. 0
N. E. 23°	54	49. 7		21. 1	
N. E. 6.	36	35. 8		03. 8	
		161. 3	10. 0	2 9	134. 8
		10. 0			24. 9
		151. 3			109. 9

The whole Difference of Latitude is 151 $\frac{3}{10}$ North, the Departure 109 $\frac{9}{10}$ Weſt. The Courſe and Diſtance are found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table*, (according to *Middle Latitude*,) ſailing thus: Find the Complement of Middle Latitude in the Degrees at the Top or Bottom of the Table, and under or above that in the Column of Departure; find your Departure, and right againſt that, in the Column of Diſtance, you have the Difference of Longitude.

Example. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Lat. 50 Deg. 00 min. North; then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and conſequently the middle Latitude is 51 deg. 16 min. its complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110; but the Table not proceeding ſo far, I take its Half, *viz.* 55, the neareſt to which in the Table, 54.8 (being leſs) againſt which, in the Column of Diſtance 87, which doubled (becauſe I took half the Departure) the Sum 174 min or 2° 54 is the Difference of Longitude required, which is ſufficiently exact for common Practice; only I would adviſe all Perſons for avoid-ing as much as poſſible any Error, that every time of reckoning is corrected by an Obſervation, the Longitude be alſo corrected according to *Mercator*'s Sailing, as you are taught in the laſt Edition of Practical Navigation, as likewiſe by the new Edition of *Atkinſon*'s Epitome.



Some neceſſary Aſtronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppoſite one to the other; the one viſible to us, called the North Pole, marked with the Letter N; the other not viſible to us, called the South Pole, marked with S.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed the Diurnal Revolution, as the Line N. S.

The *Equinoctional* is a great Circle 90d. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſpheres; it is noted by the Letters E. W.

The *Ecliptic* is a great Circle interſecting the Equinoctial in two oppoſite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23d. 29m. It is divided into equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈	called Northern Signs	*Libra*	♎	called Southern Signs
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptic* is noted by the Characters of the 12 Signs, as above.

The Poles of the *Ecliptic* are two Points 23d. 29m. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiac* is a *Zone*, having about 8 deg. in Breadth on either ſide of the *Ecliptic*, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles as, N. M. S.

The *Tropicks*, are two ſmall Circles 23 deg 29 min. diſtant from the Equinoctial, being parallel thereto, and limit the *Sun*'s greateſt Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*; the South Tropic is called the Tropic of *Capricorn*, and marked with B ♑

The *Polar-Circles* are two ſmall circles 23 deg. 29 min. from each Pole of the World, being parallel to the Equinoctial as E. G. and D. Y.

The *Zenith* is an imaginary Point in the Heavens, directly over our Head (*viz.*) 90 deg. diſtant from the Horizon, as Z.

The *Nadir*, is the Point diametrically oppoſite to the *Zenith*, as R.

The *Azimuths* are great Circles interſecting each other in the *Zenith* and *Nadir*, and cutting the Horizon at Right-angles, Z. A. R.

The *Horizon*, is a great Circle 90 deg. diſtant from the *Zenith* and *Nadir*, and divides the World into the Viſible and Inviſible Hemiſpheres, as H. O.

The *Meridian* of a Place, is that Meridian that paſſeth by the *Zenith* and the *Nadir* of the ſaid Place: and is is repreſented by the Circle Z. H. R. O.

Parallels of *Altitude* or *Almicanters*, are ſmall Circles parallel to the Horizon; imagined to paſs through any degree of Altitude between the *Horizon* and the *Zenith*, as L. P. T.

Parallels of *Declination*, or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of *Declination*, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ♋ P. C.

Circles of Longitude in the Heavens, are great Circles interſecting each other in the Poles of the Ecliptic, and cutting the Ecliptic at Right-angles.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star, and the Ecliptic, and is accounted either Northerly or Southerly.

The *Longitude* of a Star, is an Arch of the Ecliptic intercepted between the Circle of Longitude paſſing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star, is an Arch of the Meridian, contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Aſcenſion*, is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Aſcenſion, is the Degree and Minute of the Equinoctial, that riſeth with the Center of the Sun or Star, in an Oblique Sphere.

Oblique Deſcenſion, is the Degree and Minute of the Equinoctial, that ſets with the Center of the Sun or Star, in an Oblique Sphere.

Aſcenſional Difference, is an Arch of the Equinoctial contained between the Right and Oblique *Deſcenſion* or *Aſcenſion*, or it is the Difference of the Time between the Sun-riſing or ſetting, and Six o'Clock.

The *Amplitude*, is an Arch of the Horizon, being the diſtance of the riſing or ſetting of the Sun or Star, from the Eaſt or Weſt, and is accounted either Northerly or Southerly.

The *Latitude* of a Place, is the Height of the Pole above the Horizon, or the diſtance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equator, contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other Place, and is accounted either Eaſterly or Weſterly.

Aſtronomic Problems uſeful in NAVIGATION.

PROBLEM I.

THE Sun's Place, and greateſt Declination given, to find it's preſent Declination.

Example.

Suppoſe the Sun's Place to be 20d. 30m. in *Gemini*, the greateſt Declination is 23d. 29m; it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius—	10.000000
To S. Sun's greateſt Declination 23d. 29m.—	9 600409
So is S. Sun's Longitude 80d. 30m. from Aries—	9.994003
To S. Sun's preſent Declination 23d. 09m. North—	19.594412

By Gunter.

The Extent from Radius S. 90d. to S. 23d. 29m. will reach from S. 80d, 30m. to the S. 23d. 9m. the Sun's Declination N. becauſe in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point. Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius*, or *Piſces*, the Longitude is accounted from *Aries*, but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs: Conſequently, if the Sun's Place be in any of the firſt ſix Signs, the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declination and preſent Declination given, to find his Place.

The Sun's greateſt Declination is 23d. 29m. and preſent Declination is 18d. 30m. North increaſing, the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greateſt Declination 23d. 29m.— ——— 9.600409
To the Radius— ——— ——— ——— ———10.000000
So is the Sine of the preſent Declination 18d. 30m. North— ——— 9.501476
To the Sine of the Sun's Longitude 52d. 46m— ——— ——— 9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries*, becauſe the Declination is North and increaſing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By Gunter.

The Extent of the Compaſſes from the Sine 23d. 29m. the greateſt Declination to Radius, S. 90d. will reach from S. 18d. 30m. the Sun's preſent Declination, to 52d. 46m. the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Example.

The Sun's Place 10d. 30m. in *Aquarius*, the Right Aſcenſion is required.

The Operation by the Logarithms.

As Radius— ——— ——— ——— 10.000000
To the Tangent of the Sun's Longitude from *Aries* 49d. 30m. — 10.068501
So is the S. c. of the greateſt Declination 23d. 29m.— ——— 9.962453
To the Tangent of the Sun's Right Aſcenſion 47d. 2m.— ———10.030954

By Gunter.

The Extent from Radius S. 90d. to S. c. of the greateſt Declination 66d. 41m. will reach from Tangent Sun's Longitude from *Aries* 49d, 30m. to the Tangent of the Right Aſcenſion 47d. 2m. required.

Note. This Proportion gives the Sun's Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succeſſion of the Signs; and therefore in this Caſe 47deg. 2m. ſubtracted from 360deg. (becauſe the Sun is in the 4th Quarter of the Ecliptic, or South decreaſing) gives 312d, 58m. the Right Aſcenſion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As S. c. of the Latitude 51d. 32m. — — — — 9.793832
To Radius — — — — — 10.000000
So is the S. of the Declination 15d. 20m. North — — 9.422318
To the S. of the Sun's Amplitude 25d. 9m. 9.628486

By Gunter.

The Extent from the S. c. of the Latitude 38d. 28m. to the S. of the Declination 15d. 20m. North, will each from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North; and if the Declination be South, the Amplitude is alſo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51d. 32m. North, the Sun's Declination is 10d. 45m. North, and the Aſcenſional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51d. 32m. — — 9.900086
To Radius — — — — 10.000000
So is the Tangent of the Sun's Declination 10d. 45m. — — 9.278424
To the Sine of the Aſcenſional Difference 13d. 49m. — — 9.378338

By Gunter.

The Extent from Tangent 38d. 28m. (the Complement of Latitude) to Tangent 10d. 45m. the Sun's Declination; will reach from Radius S. 90d. to S. 13d. 49m. the Sun's Aſcenſional Difference as above.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, find the Aſcenſional Difference by the fifth Problem.

Secondly, the Right Aſcenſion by the third Problem.

When the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, gives the Oblique Deſcenſion. But when one is North and the other South, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted, gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 Degrees, then ſubtract the Aſcenſional Difference therefrom.

Or if both being added together exceed 360 deg. the Exceſs is the Oblique Aſcenſion or Deſcenſion.

PROB. VII.

To find the Time of the Sun's riſing and ſetting, and Length of the Day or Night.

Find the Aſcenſional Difference by the fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 deg. of the Equinoctial 1 Hour, and for every Degree 4 min. of Time, and for every 15 Minutes of the Equinoctial, 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference added to 6 Hours, gives the Time of Sun-ſetting; and ſubtracted is the Time of Sun-riſing.

2. But if one be North and the other South, then the Aſcenſional Difference added, gives the Time of Sun-riſing, and ſubtracted is the Time of Sun-ſetting.

The Time of Sun-ſetting doubled, gives the Length of the Day; the Time of Sun-riſing doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, ſuppoſe the Sun's Declination 21d. 57m. North, the Aſcenſional Difference is 30d. 29m. which reduced to Time is

	H. M. S.		H. M. S.		
	2 01 56				
	6 00 00				
Sun ſetteth —	8 01 56	doubled is	16 03 52	Length of the	Day
Sun riſeth —	3 58 04		07 56 08		Night

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth.

The RULE.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination, add them together, and take the half Sum; ſubtract the Compl. of the Declination from the half Sum, and take the Remainder; then ſet down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of theſe four Logarithms is the S. c. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90d. you muſt add 90d. thereto, and then proceed as before.

Example

Example 1.

In the Latitude 51d. 32m. North, the Sun's Declination is 20d. 30m. North, his Altitude 47d. 30m. and his Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
42	30	Comp. Altitude A. M. ———— S. Comp. Arith.	0.170317
38	28	Comp. Latitude North ———— S. Comp. Arith.	0.206168
69	30	Comp. Declination N. or Sun's Diſtance from the Pole.	
150	28	Sum.	
75	14	half Sum — — — — — — — S.	9.985414
5	44	Exceſs of the half Sum above Compl. Declination S.	8.999559
		d. m — Sum	19.361458
		61 : 21 ——S. c. — — — — half Sum	9.680729
		61 : 21	

Doubled is—122 : 42 the Sun's Azimuth from the North required.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90 deg. to S. 42 deg. 30 min. the Complement of the Altitude, will reach from South 38 deg. 28 min. the Complement of the Latitude to Sine 24 deg. 40 min. then the Extent from S. 24 deg. 40 min. to S. 75 deg. 14 min. the half Sum, will reach from Sine 5 deg. 44 min. (the Exceſs of the half Sum, above the Complement Declination) to 122 deg. 42 min. (upon the Line of verſed Sines), which is the Azimuth required.

Example 2.

In the Latitude of 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, his Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms,

d.	m.		
72	15	Compl. Altitude ——— ——— S. Compl. Arith.	0.021183
38	28	Compl. Latitude ——— ——— S. Compl. Arith.	0.206168
108	15	Declination, 90 Degrees being added, becauſe South.	
218	58	Sum.	
109	29	Half Sum Supp. to 180 d. is 70d. 31m. S. ———	9.974391
1	14	Remainder ——— ——— S. ———	8.332924
		d. m. — Sum	18.534666
		79 : 20 S. c. ——— ——— half Sum	9.267333
		79 : 20	

Which doubled is 158 : 40 the Azimuth from the North required.

By Gunter.

The Extent from Radius S. 90d to the S. 72d. 15m. the Compl. Altitude will reach from S. 38d. 28m. the Complement Latitude, to S. 36d. 20m; then the Extent from S. 36d. 20m. to 70d. 31m. the Supplement of 109d. 29m. (the half Sum) to 180d. will reach from the Remainder 1d. 14m. to 158d. 40m. (upon the Line of verſed Sines) the Sun's Azimuth as above.

In South Latitude, the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame Manner you may find the Azimuth of any Star.

PROB. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude of 51d. 32m. North, ſuppoſe the Sun's Declination 23d. 29m. North, the Altitude 36d. 30m. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude, add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Complement Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of theſe four Logarithms, is the S. c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by Logarithms.

d.	m.				
66	31	Compl. Declination	—— ——	S. Co. Ar.	0.037547
38	28	Compl. Latitude	—— ——	S. Co. Ar.	0.206168
53	30	Compl. Altitude			
158	29	Sum			
79	14	Half Sum	—— ——	Sine —	9.992287
25	44	Remainder	—— ——	Sine —	9.637673
				Sum	19.873675
d.	m.				
30	09	—— S. c.	——	Half Sum	9.936837
30	09				

which doub. is 60 : 18, and reduced into Time, makes 4 Hours 1 Minute $\frac{1}{5}$ the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 Hours 1 Min. $\frac{1}{5}$ ſubtracted from 12 Hours, leave 7 Hours 58 Min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been Southerly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the Eighth Problem; do the ſame when the Declination is North in South Latitude.

By Gunter.

The Extent of the Compaſſes from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Verſed Sines) the Hour of the Day as above.

PROB. X.

Having the Latitude of the Place, the Sun's Right Aſcenſion with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example.

Example.

In the Latitude of 51 deg. 32. min. North, on the 18th of *January*, 1753, the Sun's Right Aſcenſion was 20 hours 2 min. the Right Aſcenſion of the *Lion's Tail* was 11 hours 35 min. the Declination 16 deg. 6 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the Hour of the Night required.

The RULE.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Sun's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereunto add the Sines of half the Sum and Remainder: Half the Sum of theſe four Logarithms, is the S. c. of half the Diſtance from the Meridian.

The Operation by Logarithms.

d.	m.			
73	54	Compl. Star's Declination — — —	S. Co. Ar.	0.017377
38	28	Compl. Latitude — — — —	S. Co. Ar.	0.206168
59	30	Compl. Star's Altitude		
171	52			
85	36	Half Sum — — — — — —	Sine ——	9.998905
26	26	Remainder — — — — — —	Sine ——	9.648512
			Sum	19.870962
30d.	28m.	—— S. c. ———	Half Sum	9.935481
30d.	28m.	——		

which doubled is 60d. 56m. and reduced into Time, gives four Hours three Minutes, forty-four Seconds, or 3 quarters of a Minute.

By the Directions given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian, ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but if the Star be to the Weſtward of the Meridian, add the Star's Diſtance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the Hour of the Night. In this Example, the Sun's Right Aſcenſion 20 Hours 02 Minutes ſubtracted from the Star's Right Aſcenſion (with 24 Hours added thereto) 35 Hours 35 Minutes, leaves 15 Hours 33 Minutes, the Time of the Star's coming to the Meridian;

from which ſubtracting 4 Hours, 3 Minutes, 44 Seconds, the Hour above found, leaves 11 Hours, 29 Minutes, 16 Seconds, the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement Declination to 90 deg. there muſt be 90 deg. added thereto, as has been ſhewn in the Eighth preceding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compaſſes from Radius S. 90d. to the S. of 73 Degrees 54 Minutes, the Complement of the Star's Declination, will reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 40 Minutes; then the Extent from the S. 36 Degrees 40 Minutes, to S. 85 Degrees 56 Minutes the half Sum, will reach from S. 26 Degrees 26 Minutes the Remainder, to 60 Degrees 56 Minutes (upon the Line of Verſed Sines required;) with which proceed as hath been directed to find the Hour of the Night.

Courſes and Diſtances between ſome of the moſt eminent Places on the Coaſt of England, *&c. As alſo the thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South Coaſt of* England *and* France, *and the Weſt Coaſt of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth*, N. W. by N.	14
From *Buchaneſs* to *Cathneſs*, North Weſt	27
From the *North Foreland* to *Fluſhing*, Eaſt	24
From the *North Foreland* to the *Texel*, N E. by N. half Eaſt	50
From the *Spurn* to the *Texel*, Eaſt by South	55
From *Tinmouth* to the *Naze* of *Norway*, N E. by E.	118
From *Tinmouth* to *Holy Land*, Eaſt by South	110
From *Tinmouth* to the *Scaw*, Eaſt NorthEaſt	110
From *Yarmouth* to the *Texel*, Eaſt by North	34
From *Newcaſtle* to *Maes Deep*, E N E.	83
From *Aberdeen* to *Maes Deep*, South Eaſt	113
From the *North Foreland* to the *Maes*, E N E.	30
From *Newcaſtle* to the *Fly*, E S E.	90
From *Scarborough* to *Holy Land*, Eaſt Northerly	97
From the *Start* to the *Eddyſtone*, Weſt half South	7
From the *Land's-end* to *Scilly*, W. S W. three quarters Weſt	9
From the *Caſkets* to *Blakeneſs*, Eaſt North Eaſt	55
From *Beachy* to *Blakeneſs*, Eaſt a quarter North	15

From *Dover* to *Diep*, South half Weſt — —— —	25
From the *Lizard* to *Guernſey*, Eaſt by South —— —	35
From the *Start* to *Seven Iſles*, South half E. — ——	25
From *Scilly* to *Uſhant*, S E. by S. — — —	35
From the *Lizard* to *Uſhant*, South —— ——	29
From *Hartland Point* to the *Iſland of Lundey*, North —— —	03
From *Lundey* to the *Holms*, Eaſt by North, Northerly ——	18
From *Black-Rock* to *Tuſcar*, Eaſt North Eaſt — — —	03
From *Cape-Clear* to *Old-Head*, Eaſt by North — —	13
From *Greſholm* to *Waterford*, Weſt by North — ——	21
From the *Land's-end* of *England* to *Tuſcur*, North by Weſt — —	40
From the *Land's-end* of *England* to *Waterford*, N N W. ——	40
From *Holy Head* in the Iſland of *Angleſey* to the Bar of *Dublin*, W. by N.	18
From *Rochel* to the *Black Rock*, South by Eaſt —— ——	80
From the *Land's-end* of *England* to *Cape Clare*, N W. by W. — —	55
From the *Land's-end* of *England* to *Old Head*, North Weſt ——	45

A Table of the Soundings coming into the Channel, *reſpecting the Bearings and Diſtances of* Scilly, Uſhant, *the* Lizard, *&c. with the Depths in Fathoms, and the various Sorts of Ground.*

	Bearings.	Diſt.	Latit.		Dep.	*The various Sorts of Ground.*
			D.	M.		
Scilly.	South.	05	50	20	50	Branny ſand, like ground wheat.
	S S E.	05	50	12	45	White ſand mixed with ſhells.
	S S E.	06			50	Coarſe ouſe.
	E S E.	06			53	Coarſe ſand and fine red ſhells.
	E by S.	08	50	12	78	Ouſe ſand, with Queens ſhells amongſt it.
	E by N.	07	49	15	72	Ouſe like muſtard-ſeed, with broken ſhells.
	E by N.	15	48	50	72	Pepper ſand, black and yellow.
	E by N.	24	49	50	72	Black, white and red ſtones with ouſe.
	E N E.	07	49	15	60	Some black ſand.
	E N E.	20	49	15	80	Rocky ground.
	E N E.	55			103	Fine white ſand.
	NE by E.	22	49	10	85	Sand and ouſe together.
	NE by E.	10	49	20	55	White and red ſand mixed with ſhells.
	NE by E.	50	49	50	100	White ſand with ouſe and nits.
	NE by E.	25	49	50	64	Branny ſand with white and red ſhells.
	NE by E.	06	49	10	48	Black ſand.
	NE by E.	13	49	43	65	Branny ſand with ſome pieces of ſhells.

	Bearings.	Diſt.	Latit.		Dep.	*The various Sorts of Ground.*
			D.	M		
Scilly.	North Eaſt	10	49	40	65	Branny Sand, ſmall ſtones, herring bones.
	NE by N.	10	49	20	57	Small red ſand.
	N NE.	10	49	47	100	White ſand then entering on the Bank.
	N by E.	18			68	Red ſand with black and white ſcollop ſhells.
	North	12	49	15	65	Broken ſhells, with white and red ſand.
	North	10	49	47	65	White ſand on the Eaſt part of the Bank.
	N N W.	33	48	52	77	Red ſand and ſhells amongſt it.
	NW by N.	07	49	40	54	More ſhells, the *Lizard* NE. diſtant 18 leag.
	North Weſt	04	50	10	50	Branny ſand, with black and broken ſhells.
	North Weſt	07	49	47	60	Stony ground.
	NW by N.	04	50	25	61	Red and black ſand, with gliſtering ſhells.
	NW by W.	2½			44	Shells and ſand like the points of needles.
	W by N	13	50	25	63	Fine white ſand, with little ouſe.
	Weſt.	21	50	08	66	Red and black ſand, with gliſtering ſhells.
	W by S.	32	49	50	75	Fine white ſand and gliſtering ſhells.
	W by S.	3½			40	Like broken wheat or courſe bran.
Uſhant.	North	06	48	36	63	Full of ſmall Maes ſand.
	N by E.	18	48	15	80	Round ſtones mixed with ſcollop ſhells.
	NE by N.	11			60	Small beaten Shells and Hakes teeth.
	North Eaſt	29	48	50	85	Great and ſmall pieces of cockle ſhells.
	North Eaſt	25	48	10	55	Grey and brown ſand with white ſhells.
	NE by N.	07	48	30	68	White and grey Maes ſand.
	E N E.	14	48	36	68	Small ſhells and herring bones.
	E by N.	25	48	30	85	White and grey ſand with ſmall red ſtones.
	Eaſt	18	49	00	70	Branny ſand with ſome ſhells.
	Eaſt	06	49	00	65	Red ſand, ſhells, things like needle points.
	Eaſt	15	49	15	70	Fine white ſand.
	Eaſt	33	49	15	87	Dazling ſand like barley-ſtraw.
	Eaſt	04	49	10	60	Full of Maes ſand and broken ſhells.
	E by S.	14	48	56	63	Shells like Perriwinkles.
	E S E.	15	48	15	70	Shells grey, and red pieces of cockle-ſhells.
	E S E.	12	49	20	68	Groſs white ſand with ſhells.
	E S E.	08	49	05	64	White ſhells and fine ſmall ſtones.
	E S E.	06			61	Hakes teeth, and ſhells like oatmeal huſks.
	SE by E.	20	49	15	72	Great ſtones like beans and peaſe.
	SE by E.	09	49	15	65	Sand and ſome ſhells.
	SE by E.	37	48	30	65	James's ſhells.
	SE by E.	15	49	25	60	Small ſcollop ſhells, with ſome ſtones.

Bearings.

	Bearings.	Diſt.	Dep.	*The various Sorts of Ground.*
Lizard.	North Eaſt	06½	43	Marſhy-ſhells, and ſome Scollop-ſhells.
	NE by N.	10	52	Marſhy-ſhells, and Hakes Teeth.
	N N E.	09	50	Marſhy-ſhells like Oatmeal-Huſks.
	N by E.	15	58	Marſhy-ſhells and Hakes Teeth.
	North	01	39	Stones as big as beans four Leagues off.
	North Weſt	05	45	Grey Sand like Oatmeal Flour.
	North Weſt.	03	46	Marſhy-ſhells like ſmall Stones.
	W N W.	03½	47	Small ſhingly Stones, and Marſhy-ſhells.
	W by N.	04	40	Fine Marſhy-ſhells like white Stones.
	W by S.	03	41	Black gravelly Ground with ſmall Stones,
	NE by E.	12	57	Scollop-ſhells.
	NE by E.	04	44	Great Stones and rough Ground.
	North Eaſt.	06½	50	Like Huſks of Oatmeal and ſmall Stones.
Eddyſtone.	N ½ Mile		35	Dirty brown Sand and Hakes Teeth.
	W 2 Miles		34	Dirty brown Sand.
	S 1 Mile		26	Fine Sand, and within this 28 and 30 Fathom.
Start.	N by E Nly.	08½	40	Like the Duſt of a Grindſtone, with Hakes Teeth and Shells.
	NW by W	04½	43	
	NW by N.	03	38	Gravelly Sand, ſmall Stones and Shells.
	N by WWly	12	38	Reddiſh Shells maſhed, as if beat in a Mortar, white Sand and Scollop-ſhells.
	NW by W.	14	43	
Foreland.	NE by E.	08	35	Small ſhingly Stones as big as Peaſe.
	North	08	40	Streamy Ground with ſmall Stones.
	N by E.	05½	33	The ſame with ſome black Sand.
	NE by N.	11	41	Fine Sand, and Scollop-ſhells.
	N N E.	08	40	Fine Sand, Scollop ſhells and ſmall Stones.
	NE by E.	02½	27	Shingly Ground.
	W N W.	02½	20	Small Stones.
Needles.	NE by E.	02	17	Great ſhingly Ground.
	NE ½ E.	02½	17	Small ſhingly Ground,
	North Eaſt	02	13	Rocky Ground.
I. Wight.	N by W.	03½	20	All the Ground from St. *Alban*'s to the Eaſt-end of the *Wight*, is chalky and brown Sand.
	E by N.	04	21	
	N by E.	03	18	
Dannoſes.	W by S.	04	16	Rough Ground, with ſome big Stones.
	Weſt	04	21	A kind of ſandy fiſhy Ground.
	W N W.	08	33	Fiſhy Ground, ſomewhat red, with Stones as big as Peaſe and ſmall Beans.
	N by W.	06	26	

Directions to ſail into ſome of the Principal Harbours on the Coaſt of England.

Directions to ſail into Scilly.

SCILLY is divided into divers Iſlands; along the Weſt lie a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt, called St. *Mary*'s Sound, is the beſt, being a fair opening of the Channel; but near the midſt lie two ſunken Rocks, which in foul Weather the Sea may be ſeen to break over: It is beſt to leave them on the Larboard-ſide going in, and on the Starboard-ſide coming out: Go ſo near the Starboard-ſhore, as that a Stone might almoſt be thrown on it. And when you are within the Point, luff up round, and come to an Anchor in Sight of the Houſes, or when the Town is brought open to the Valley, leave two Thirds of the Harbour on the Larboard-ſide.

Directions for ſailing into Mount's-Bay.

To anchor in Gover's Lake.

There are two ſunken Rocks which lie right in the Way of going into the Lake, about a Mile without your Anchoring Place; theſe Rocks lie N N W. and S S E. about half a Mile in length, to ſhun which obſerve the following Directions.

If the Wind is in the Eaſtern Hank, give the Eaſtern Shore about a League Birth, and keep St. *Paul*'s Church wholly in Sight above the Hill, 'till you bring a Church on the Eaſtern Shore a Sail's Breadth to the Northward of St. *Michael*'s Mount, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul*'s Church down under the Hill, then let go your NE. Anchor, and carry the other to the SW. and you will be well moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll go clear of them to the Eaſtward, and when it ſhuts down you are to the Weſtward of them, and when upon them, the Top of the Tower and a long Hedge is in one, about 6 or 7 Feet at low Water.

If the Wind is in the Southern or Weſtern Hank, keep the Land on board, which is bold; you may go within a Quarter of a Mile of the Point: run till you ſhut *Mouſehole* Iſland in, and St. *Paul*'s Church down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground, as before mentioned: Be ſure to have the Church on the Eaſtern Shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never ſtart, the Wind at SSE. or SE. heaves in a great Sea, and raiſes a great Ground Sea when it blows hard; the harder it blows you have a ſtronger Outſet in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will ſooner ſtart with the Wind to the N. or NW. becauſe the Ground goes out with a little Deſcent.

To ſail into Foy.

Foy may be very eaſily known, lying in between two high Lands; on the Weſt-ſide going in, is an old Church and Caſtle, and on the Eaſt-ſide the Ruins of an old Church, as you may ſee by the making of it in Capt. *Collins*'s Draught of *Foy*. The going in is a Cable's Length over from Side to Side, and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch* War, in the Year 1666, there were above ſixty Sail of *Virginia* Ships put into this Harbour. This Place lieth N E. and S W. in and out, which makes it a better Out-let to the Weſtward than *Plymouth* or *Falmouth*. And whereas it hath been reported to be a Bar-Harbour, and that you cannot enter till half Tide, I do aſſure you that there are no leſs than three Fathom at Low Water at a Spring Tide; here you may lie aſhore to waſh, tallow, or ſtop Leaks; the Spring Tides riſe and fall 16 and 17 Feet, and it is High Water here at Full and Change a Quarter paſt five. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the Weſt-ſide lieth a Rock above Water, you may ſail in on either Side of it; on the Inner-ſide of the Eaſt-Point lie alſo ſome Rocks off the Shore; on the Eaſt-ſide is deepeſt Water and moſt room, therefore in going in give the Eaſt Point a large Birth; there will be 7 or 8 Fathom. Keep the ſaid Shore till you come within St. *Maud's* Caſtle; which when it bears Eaſt, there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick*, is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth* Caſtle, and ſo it muſt be kept till you ſhut the Church over *Penny Comquick*, into the N E. End of the *Smithick*, and ſo bear over to St. *Maud's*, and ride with the Caſtle E. laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in four Fathom, as ſhall be moſt convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth* Sound lieth a high round Rock called *Mewſtone*; between it and *Ramhead* lieth the ſaid Sound, N N E. being round and deep.

A little to the Northward of *Ramhead*, is a fair ſandy Bay, where is good Anchoring cloſe under the Land, in 9 or 10 Fathom: South a little Eaſterly from *Ramhead*, lies a Rock above Water, called the *Eddyſtone*, (on which is erected a Light-houſe) the Point of *Plymouth* lies from it N. by E. diſtant about 4 Leagues.

In the Sound, by the Land of *Plymouth* lieth an Iſland called St. *Nicholas* or *Drake* Iſland, which is joined to the Weſt-ſide with a range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide with the Land of *Plymouth*, till *Catwater* open on the Starboard-ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the Point on the Starboard-ſide, leaving moſt Part of the Channel on the Starboard-ſide, until you come within the Point, and Anchor there right againſt the high ſteep Northern Land; there is at Low Water, with extraordinary high Tides, 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about 12 Feet Water at half Flood, which Buoy muſt be left on the Starboard-ſide going in, and when *Catwater* is altogether open, you may run into the Eaſtward, leaving in the Entry of the Harbour two-thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the S. Shore is ſomewhat flat off, there lying a ſandy Bank, which reaches to the ſecond Point of the S. Shore of *Catwater*.

A little to the Eaſtward of *Drake* Iſland lies a Rock under Water, upon which at Low Water it is not deeper than two Fathom. To ſail within the Land, you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entrance lying in between two high Lands: On each Side of the Haven ſtandeth a little Caſtle; on the Weſt-ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward, run in along by the W. Land, ſo far to the Eaſtward, until the Key of the Village (on the Eaſt-ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands: It is convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to tow in. Being come in, edge over to the Weſt-ſide before the Brew-houſe, and Anchor there in 10 or 11 Fathom, or before the Village to the Eaſt-ſide at Pleaſure. At the Eaſt-ſide lieth a ſunken Rock, to avoid which, ſteer in with St. *Patrick*'s Church, and do not bring the Village, which ſtandeth on the Weſt-ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt-ſide of the Chapel, always in Sight, without the Bulwarks on the North-ſide, by St. *Patrick*'s Church, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt Point of the *Berry* S. by E. or SSE. from you; and Anchor there in 7 or 8 Fathom, where you ſhall be Landlock'd for a S. and SW. Wind. At the North-eaſt End of the Bay is alſo a Tide Haven, called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fathom, according as you deſire to be nearer or farther from the Shore.

Directions for ſailing in at the Eaſt End of the Iſle of Wight, *to* Portſmouth *Harbour, and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight* or *Portſmouth*; after you come to the Weſtward of the Shoal, called the *Owers*, hale in NW. with St. *Hellen*'s Point; but do not hale too much to the Northward, for there lies a Bank off of *Long-ſtone* Haven, to the Eaſtward of the *Horſe*, that hath not above 13 Feet on it at Low-water, but keeping in 7 or 8 Fathom, carryeth you clear without it, and will bring you to the SE. End of the Sand called the *Horſe*. St. *Hellen*'s Church being SW. by W. from you, you may run in 5 Fathom, and when you have brought the Weſtermoſt great white Patch, or Chalk upon *Poſt-Down* (which is the high Land to the Northward of *Portſmouth*) a Ship's Length to the Weſtward of *South-Sea* Caſtle that ſtands upon the Beach, then you may luff up without Fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the Shore, until you come by the Town-wall's-End, and there you muſt bear off a little for a Flat that lieth off from the Shore, this is for an Eaſterly Wind. But if you intend for *Stoke's-Bay*, when you have brought the Fire Beacon on *Brown Down*, which is to the WNW. of *Haſlewood* Point, within a Ship's Length without the ſaid Point, then you may bear to the Weſtward along the out-ſide of the *Spit*, which is the Shoal on the Weſt-ſide of the Entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward, and Deſign for St. *Hellen*'s Road, or *Stokes-Bay*, (from *Dunnoſe* to St. *Hellen*'s Point, the Courſe is NE. by N. and NNE.) but borrow no nearer to St. *Hellen*'s than

6 or 7 Fathom, for the *Spit* lies off a great way; but if it be clear Weather, then you may keep *Sand-Down* Caſtle open of the *Culver-Cliff*, that Mark will lead you without the *Spit* of the Point; ſteer along in this Mark, untill you open St. *Hellen*'s Church about two Ships Length open of the *Red-Cliff* within St. *Hellen*'s Point, or *Port-Sea* Caſtle to the eaſtward of *South-Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellen*'s Road NW. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note, That you have no good clear Ground all along the Iſland, until you have opened St. *Hellen*'s Church as aforeſaid, and have brought the Point to bear from SSW.

From St. *Hellen*'s Point, to go between *No-Man's-Land* and the *Horſe*, the direct Courſe in, is NW. by N. and NW. but you have no Shoaling upon the SW. Side of *No-Mans'-Land*, for you have 16 Fathom, and the next Caſt but 3; but at the *Horſe* you may ſtand into 10, 9 or 8 Fathom: If the ſtrong Tide be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *No-Man's-Land*, if it be clear Weather, there are very good Marks to lead you in, which are as follow; keep the 2 Windmills on the *Downs* on the Iſle of *Wight*, that they may be ſeen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth WSW. off the Point *No-Man's-Land*.

Alſo from St. *Hellen*'s Point (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a Part of an Old Caſtle formerly called *Haſlewood* Caſtle, ſtanding on *Gilkicker* Point (which is kept white) keep *Goſport* Church and that Caſtle in one, or this Caſtle in the Middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without Fear. Or if the Wind be ſo that you are forced to turn in, then you may run the ſaid Mark within two Sails Breadth of each End of the Wood. In the Middle of the Channel is about 11 Fathom Water; and if you bring the ſaid Mark right under the North-End of the Wood, you ſhall run in a middle Ground near the *Horſe*, that hath not above 10 Feet on it at Low-water, and hard Sand.

Being in *Yarmouth* Road, and you would ſail out of the *Needles*, ſteer away from *Hurſt* Caſtle, which Place is very ſteep; being paſt the Caſtle, ſteer away for the *Needles*, which are ſharp white Rocks; giving a Birth to ſome Rocks that lie off from the Iſland-ſide in the Fairway, between the Caſtle and the *Needles*, you muſt keep cloſe to the *Needles*. The Tide of Ebb ſetteth on the *Shingles*, which are hard Stones. The Flood ſetteth on the *Needles*.

To ſail into the *Needles*, you will know the going in by the high white Land which is the Weſt-end of the *Iſle of Wight*; run boldly in with the Land, till you ſee the *Needles* Rocks, and then keep cloſe to them, obſerving the Tides, as in the directions coming out. *Note*, That there is a ſtrong Indraught that ſets in at the *Needles*, and into *Pool*; which Indraught hath haul'd many Ships into *Freſhwater* Bay. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight*.

To ſail within the Wight *in thick Weather.*

To ſail between the Main and the *Wight* in thick Weather, borrow in 6 Fathom off St. *Hellen*'s, and ſteer NW. by N. and NNW. from St *Hellen*'s Point, till you have 12 Fathom, and then ſteer more Weſterly, as you find the Depth;

come no nearer *No-Man's-Land* than 9 or 10 Fathom; in that Depth you may keep along the *Wight* Side if the Wind be Southerly; but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both Sides, and ſo ſteer W. by S. and WSW. as you find the Depth, until you come to *Cowes*. *Note*, That being about *Stoke's-bay*, there will be leſs Water; if you go nearer to *Cowes*, there you may anchor in 12 or 14 Fathom, in the midſt of the Channel, where is ouſey Ground.

Directions for Dover-Road.

The beſt Ground in *Dover-Road* is with the *Whiteway*, to the NW. of *Dover-Caſtle*, or between that Hill that comes from St. *James*'s Church, which is a flat Steeple at the North-end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwart of *Foulkſtone* in 12 or 14 Fathom is very good Ground.

Directions to ſail into the North-Foreland *through the* Gulls *in the Night.*

If your Ground Tackle ſhould fail in the Night, riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *North-ſand-head*; if you can but ſee the *North-Foreland* Light, when that Light-houſe bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering SSW.) you may be ſure it will carry you directly through with the *Brake*, by keeping your Lead carefully, and borrowing no nearer the *Brake* than five Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North-end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and the Tides fall out too early or too late; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient Time, to be at the *North-ſand-head* at the turning of the Tide to the Southward. From the *Foreland* you may ſteer out with a Flood Tide, SE. by E. and SE. or keep the Light of the *North-Foreland* NW. by N. this Courſe will lead you out. But for the more Certainty, be ſure keep the Lead well, and then you may borrow off and on with the foreſaid Winds in 7 or 8 Fathom, and ſteering out with the foreſaid Courſe, you will find the Depth ſuddenly change to 15 or 20 Fathom; then you may hale up cloſe to the Southward, along the Back of the *Goodwin*, the Eaſtermoſt-ſide of which lies SSW. and NNE. 12 or 14 Fathom, and is not above a Saker-ſhot from the Sand. But if it be in the Day Time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Mark to carry you out at the *North-ſand-head*, is a flat Church upon the *Foreland*, called St. *Peter's*, a Ship's Length to the Northward of *Broad ſtairs* Pier-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtward, till the *South-Foreland* bears W. by S. then caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Down's* Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin*, or *King's-Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides for at the *Spits* the Buoy lieth in 5, 6 and 7 Feet Water at Low-water; and the

Paſſage often alters, ſometimes more Water, ſometimes leſs. The Buoy lieth on the Weſt-end of the *Gunfleet-ſand*, and the Eaſt-end of the *Buxey*, bearing from a flat Steeple, called *Greet Holland* Church, South by Eaſt. Being over the *Spits*, you come into the *Wallet*, where there is very good Anchoring in 5, 6, 7 and 8 Fathom Water; the Sands lying without, make it a moſt excellent Road. There is a good and deep Channel to ſail in at the *Wallet*, between the *Gunfleet* and the *Weſt* Rock, but 'tis ſeldom uſed. Being over the *Spits* in the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on it; keep about half a Mile or a Mile off from the *Naze*, to avoid the Stone Bank which hath but 5 Feet Water on it at Low Water; and lieth from the *Naze* Trees E. by N. About a Mile and a half from the *Naze* Point there is about 8 or 9 Feet Water between it and the *Naze* at Low Water; keep *Payne*'s Trees, that lie a little to the Southward of *Harwich*, open and ſhut with *Harwich Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Corkland*, juſt open of the *Nazeland*, will carry you on the Bank alſo. There is a good leading mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will alſo carry you between the *Pyeſand* and the Ridge into the *Rowling-Ground*, where the Ships anchor in 3 or 4 Fathom at Low-water. The Mark to anchor in the beſt of the *Rowling Ground*, is to bring *Harwich* Windmill 2 Sails Breadth open of *Harwich* Cliff: And to ſail from the *Rowling-Ground* to the *Naze*, keep *Payne*'s Trees open off *Harwich* Cliff, 'till you bring the *Naze* to bear SW. then keep *Harwich* Steeple on the Beacon Cliff to run within the Stone Bank. There is a Channel to ſail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees SW. ſailing down NE. between the Cork and the Ridge, in 5, 6, and 7 Fathom Water. And when you have brought *Harwich* Steeple on the Brew-houſe that lieth to the Northward of *Languard-Fort*, then are you clear of the Cork Ledge; this Channel is much uſed by the Light Colliers going to the Northward.

Being in the *Rowling-Grounds*, and that you would ſail into *Harwich* Harbour, keep cloſe by the *Andrews*, which is a Sand that lieth off from *Languard Fort*, and is ſteep too on the Weſt-ſide, the Tide of Ebb runneth ſtrong over the *Andrews*, the firſt half Ebb of which you muſt have a Care. This Sand is dry at Low-water; keep cloſe by the Beach of *Languard-Fort*, to avoid the *Altar*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard-Fort*, about a Cable and a half's Length from the Beach at the Fort, on which is but 5 or 6 Feet at Low-water: You may ſail to the Weſtward of it, between it and *Harwich* Cliff; according as the Tide is up, and what Draught of Water your Ship draweth. But if you ſhould want to go into *Harwich* at Low-water, and your Ship draweth above 15 Feet, you may ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard-Fort*. Being paſt the *Glutton*, you muſt keep cloſe to the Beach to avoid the *Griſtle*, that lieth in the Middle between *Harwich* and the Beach of *Languard-Fort*, on which is but three Feet at Low-water, there is a ſmall Channel between the *Griſtle* and the Guard, of nine Feet at Low-water, but when you have opened *Dover* Court Church off *Harwich* Town, then you are clear of the *Griſtle* and the Guard, and may anchor before the Town of *Harwich*, in five Fathom Water, or run into

Ipſwich Water and anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a-ſhore, ſhe can take no harm, the Shore being ſoft ouſe. The Spring-Tides riſe 15 and 16 Feet, and the Neap-Tides 10 and 11 Feet.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to ſail over the *Spit*, then keep down by the *Gunfleet-ſand*, in 7 and 8 Fathom Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit* ESE. from the Sand about a Cable's Length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Golmore's Gat*, the Tide of Flood ſetteth ſtrong into the *Wallet*; of which you muſt have a Care when you come near it, eſpecially in little Winds or Calms, you may be hauled on the *Gunfleet-Sand*; this Sand lieth NE. and SW. and drieth in ſeveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* SE. by E. Eaſterly; you may ſtand into 7 or 8 Fathom along the Side of the W. Rock into the *Sled-way*, keeping *Balſey* Church N. by W. and NNW. till you bring *Harwich* Steeple on the Brew-houſe (that lieth to the Northward of *Languard Fort*) which will carry you clear of the Cork Ledge, on which is two Fathom and an half at Low-water, and then ſtand to the Weſtward, and keep *Orford* Church and Caſtle open of *Balſey* Church a Sail's Breadth, till you have the Lights together, keep them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*; you may ſtand in upon the *Flatters* into five Fathom, on which Sand is but 2 and 3 Feet at Low-water; the Ridge hath 7 Feet at Low-water; a great Part of the Cork Sand drieth at Low-water, and lieth in Length NE and SW. about two Miles and a half long, and a Mile broad: Weſt Rocks lie in Length NE. and SW. about three Miles, and two Miles broad, and drieth in ſeveral Places, full of Banks and Swatches, the Ground rocky and ſtony in many Places; there is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For the more particular Directions for ſailing into theſe and other Harbours in *England*, *Scouland*, *Ireland*, *Holland*, *Normandy*, *Bretagne*, &c. ſee the laſt Edition of the COASTING-PILOT, newly Corrected and Re-printed for *Jane Grierſon* at the Corner of *Caſtle-lane* in *Dame-ſtreet*, *Dublin*, with many Additions.

The IRISH Coaſter, *being a Deſcription of the Sea-Coaſts round the Kingdom of* Ireland.

Between Waterford *and* Dalkey.

IRELAND being furniſhed with many extraordinary good Harbours, beyond any other Kingdom in the World, and being alſo naturally extremely well ſituated for Trade, it were to be wiſh'd that the Publick would be at the Charge of an actual Survey of the Sea-Coaſts: In the mean Time, I ſhall from what has been already Printed, and from ſeveral Journals and Informations I have procured, give the beſt Inſtructions I can to thoſe who have Occaſion to viſit thoſe Ports and Harbours for Trade, or for thoſe who, by contrary winds and weather, may be driven on that Coaſt, and would be glad to have Directions where they may have a ſafe Harbour.

From the *Land's End* of *England* to *Waterford*, the Courſe is N. N. W. 40 Leagues, with that Courſe you ſhall fall Right with *Waterford*; but from *Scilly* to *Waterford*, the Courſe is N. by W. ſomewhat Northerly, 40 Leagues, betwixt both, it is all Ouſey, and ſoft Ground.

Nine or Ten Leagues from *Ireland*, in the *Offing*, lies a Sand-bank 40 Fathom deep, where commonly Fiſhermen lie to fiſh; that is a certain Mark of the diſtance of the Land, which when you find it in clear weather, you may ſee the high Mountain of *Dungarvan*.

(From *William Doyle*'s New Chart.) The City of *Waterford* lieth in Lat. 52d. 10m. and Long. 7d. 25m. W. from *London*. 'Tis waſhed by the River *Sure*, which is united to the *Nore* and *Barrow*; theſe are uſually call'd the *Three Siſters*; Rivers, which by their far extended and navigable Branches, excellently diſpoſe this City for an advantageous Trade, and its Quay is not inferior to, but rather exceeds (as well in Beauty and Extent, advantageous lading and unlading great Ships:) the moſt celebrated in *Europe*.

At the City an Eaſt and Weſt Moon, on the Full and Change Day make High-Water, but on the Bar 'tis 45 min. ſooner. The Bar is a very narrow Ridge (ſcarce a good Ship's length) of looſe ſhingle, extending as in the Chart; it has been known, that on the Full and Change Days (ſtrong Northerly Winds prevailing) that there has been more than 13 Foot Water, even ſomewhat towards the Eaſt-ſide, by ſome accounted the deepeſt, but Southerly winds augment the Water proportionally, and in calm Weather, on the ſaid Days at High-Water, you have 26 Foot, ſufficient for Ships of great Burthen.

By the common Compaſs, being near *Creten-Head*, the Courſe for *Duncannon* Fort is N. N E. but the Conſtruction of this, is by Allowance of the Variation, ſo the Courſe is N. Ely. 8 deg. 15 min. Carefully avoid the *Spit* and *Balliſtraw*, a very dangerous and hard Sand, as is alſo *Drumroebank*; obſerving when you bring Father *Hogan*'s Houſe and *Newtown* Trees in one, that you then are entering the narroweſt Part of the Channel; the Soundings are carefully laid down, and the Lead going keep the proper Eaſt Channel, what is improperly called the Weſt Channel, is by no Means practicable, nor is it adviſeable for Mariners (even at flowing Water with Ships of Conſideration) to attempt ſailing over the ſaid Bank. The *Perch* is a good Mark to avoid it, and when you have paſt it you arrive at *Paſſage*, where (as indeed the whole Harbour over) you have good anchoring, excepting only where the Contrary is fully repreſented in the new Chart.

Tramore Bay, notorious for Shipwrecks, ought to be carefully avoided; when *Hook Tower* cannot be ſeen in hazy weather, it hath been frequently taken for *Waterford* Harbour, to the loſs of many; the Wind blowing hard from S. S. E. to S. W. tumbles in a great ground rowling Sea, which join'd to a great Indraught towards *Rhineſhark* Harbour (wherein the Tide ſets with great Force and Velocity) renders it almoſt impoſſible for imbayed Ships to Weather the *Heads*; and the Ground being generally as well on the Eaſt and Weſt Sides, as almoſt over the Bay, foul and rocky, Cables are frequently cut. In this Extremity, ſuch as can't obtain *Rhineſhark*, ought, if they poſſibly can, endeavour to run aſhore, as directed in the N. Chart.

Such as would Sail into *Rhineſhark* Harbour, where, as on *Waterford* Bar, ſo here, it flows exactly the ſame as to Time and Height of Water. They muſt keep the Eaſtern Shore very cloſe on Board, and being near the Bar *Point*, Sail over the Bar *Rock*, whereon at the loweſt Ebb in Springs, there are 2 Feet Water;

'tis flat and about 50 Foot long. This muſt be done to avoid the *Spit*, which is a ſhifting Sand, but never incommodes the Channel; carefully, by the Lead going, keep the Channel which is directed by the ſoundings; for on either Side the Shore is ſteep at Low-Water, from *Baſſa Tiera* inwards, where you may with ſafety anchor or run on Shore at Pleaſure.

Slade-Pier was founded at the private Charge of the late Ingenious Mr. *Manſfield*, 'tis at preſent in a State of Decay, nevertheleſs uſeful to diſtreſſed Mariners and others, of courſe worthy of Improvement and Repair.

Slade Bay is pretty foul Ground, the beſt anchoring place is found by bringing the *Pier Head* and *Caſtle* in one, oppoſite to a Stone-wall extended to the Sea-ſhore, then in 5 Fathom, you have clear ſandy Ground; an E. by N. and a W. by S. Moon make High-water on Full and Change Days, and in the *Pier* it then ordinarily flows 13 Foot.

Hook-Tower, an excellent Light-houſe, is above 100 Foot high, and of great Antiquity, the Tides, in Time and Height, flow as in the *Slade-Pier*. The falling of the ſtreams of the *Tower*, and the E. and W. Coaſt adjacent in *Offin*, is govern'd by an E S E. and W N W. Moon on the Full and Change Days, and the Current ſets E N E. and W N W. alternately. The Rule is, That when at *Waterford* (where, on ſaid Days, an E. and W. Moon make High-Water) 'tis half Ebb, and ſo to half Flood (which is ſuppoſed ſix Hours) the Current ſets to the Weſtward, and from half Flood to half Ebb, the Current ſets other ſix Hours to the Eaſtward, which ought to be well conſidered by Mariners frequenting theſe Seas and Harbours.

Hook-Tower, by Obſervations made with a good Aſtronomical Quadrant, is in Latitude 52 d. 2 m. N. and Long. W. from *London* 7 d. 15 m. the latter being determined by Obſervations made on the late *Solar* and *Lunar* Eclipſes, and the Variation of the *Magnetical Needle*, is 14 d. 15 m. Weſterly, as found by *William Doyle.*

From the Northermoſt, or ſmalleſt Iſland of the *Saltees* towards the Main Land, lies off a Ledge of Rocks, where People were wont to go over on Foot, but now a Ship may ſail over them.

From *Saltees* to *Waterford*, you have good gradual Shoalings from 36 Fathom to 21, about 2 Miles from the Shore.

For to ſail betwixt the *Saltees* and the main Land, you muſt leave 2 thirds of the diſtance of the Water from the Iſlands, and one third Part from the Main, and you ſhall have at Low-water about two Fathom.

Above half a League without the Southermoſt Iſland of the *Saltees*, lies a Rock above Water, called *Kinbegh*, and S. W. about ſo far from it, and S. by W. from the Weſt-end of the *Saltees*, lies a ſunken Rock called *Kilmore*, of the bigneſs of a Ship, which at half Ebb is above Water; it is ſo ſteep that a Man may lie with a Ship-ſide againſt it, and have 14 Fathom Water, ſo that (without any Danger) you may ſail along by it as near as you pleaſe.

You may alſo (if need require) ſail through betwixt *Kinbegh*, and the greateſt Iſland of the *Saltees*, but to ſail without, is the ſecureſt.

To the Eaſtward of the Rock *Kinbegh*, S E. from the greateſt Iſland of the *Saltees*, are ſome ſunken Rocks called the *Frails*, or *Furlas*, which may be ſeen at Low-Water; you may alſo ſail through within them N E. from the *Saltees*, lie alſo Rocks, the Southermoſt of which is called the *Tuns*, and the Northermoſt the *North-Rock*.

E N E. from the greateſt Iſland of the *Saltees* or *Kinbegh*, and S W. by W. from *Carnaroot*, lies a Rock above Water, called the *Trunchin*, that is clean and clear round about it without fear of Danger, but a Mile E N E. from it, lies a ſunken Rock called the *Barrel*; and about half a League S E. from it lies a ſunken Rock called the *Black-Rock*, of which you muſt take heed.

Under the Iſlands of both the *Saltees*, a Ship may ride under the greateſt at the North-Weſt-Side, neareſt the North-End.

The Mark to know the Road is a Black Rock like a Boat turned up-ſide-down, right againſt that you muſt anchor in 7 8 or 9 Fathom; there it is good ſandy Ground, and Land-locked for an E S E and S E, and South Wind; a S W. Wind bloweth along the Shore. If you anchor nearer the Shore than 5 Fathom, or thereabouts, there is rough Ground.

Under the ſmalleſt Iſland a Ship may ride at the Eaſt-ſide in 7 or 8 Fathom, ſo that the North Point of the Iſland lies N N W. from you; there you ſhall lie near Landlock'd for South weſt and North-weſt Winds.

From the Point of *Waterford* the Shore lies to the Eaſtward within the *Saltees*, E N E unto *Carnaroot*, with many Bays, and all ouſey and black ſandy Ground. A Man being acquainted there, ſhould, at a need, in many Places, find good Roads; there is nothing that can hurt you, except a foul Place a little to the Weſtward of *Carnaroot*, cloſe by the Shore.

To avoid the foul grounds of the Tees, *or* Saltees.

He that cometh out of *Waterford*, and will go about to the Southward of the *Saltees*, muſt not go more Eaſterly than E S E. to go clear of the foul Grounds which lie to the Southwards of the *Saltees*; and when the *Saltees* ſhall be North of him, then lies the Courſe from thence to the *Tuſkar*, directly N E. or a little more Eaſterly.

But for to ſail along without the *Tuſkar*, you muſt go at leaſt N E. by E. to go clear of it.

The *Tuſkar* is a great ſmooth black Rock, lying like unto a Ship turn'd upſide down, but is about twice ſo great; at the North-ſide of it lie alſo two ſmall Rocks under Water.

The *Tuſkar*, lies from the Point of *Grenore*, S E. by E. diſtant one League; from the *Saltees* N N E. 4 Leagues and a half; from *Black-Rock* alſo E N E. two Leagues and a half; and from the *Lands-end* of *England* N. by W.

S E. about 10 Leagues from the *Tuſkar*, lie 2 little Iſlands cloſe by one another (and about 4 Leagues from *Graſholm*) called the *Smals*, at High-Water and Spring-Tides, the Water floweth over them, the Northermoſt is called *Scakum*, and the Southermoſt is called *Kamey*; there lie off in the Sea two little Shoals from them, the one N N W. and the other S S E.

Betwixt the *Smals* and *Graſholm*, lies alſo a Ledge of Rocks, which at Low Water may be ſeen above Water. It is not without great Danger to go thro' betwixt them both, eſpecially with Calms, by reaſon of the Tide that runs very ſtrong through. An E S E. Moon makes High-Water without the *Smals*.

From the *Tuſkar* E. by S. about 8 Leagues, lies alſo a great Rock, with many ſmall Rocks round about it, called *Maſcus*. He that comes from *England*, and will ſail towards *Ireland*, muſt take great Heed thereof, eſpecially when as thro' weſterly or northerly Winds he ſhall be driven a little to the Eaſtward of the Courſe.

For to anchor under the Point of *Carnaroot*, coming from the Weſt, you muſt take heed to come no nearer the Shore than in 6 Fathom, until that you ſhall be paſt the high Hill that lies to Weſtward of the Point, when you ſhall have brought out the Mill to the Eaſtward the Length of a Capſton-bar, then you may anchor in 9 Fathom; there is very good riding.

From *Carnaroot* to St. *Margaret's*-Bay, the Shore lies along N E. one League; it is betwixt both rocky and foul, but the foul Ground lies not far off at Sea.

For to keep clear without it, you muſt keep ſo far off the ſhore that you may ſee the tops of the double Land within, about the Cliff-Land, and you need not fear; but if you come ſo near the Shore that the double Land within be covered of the foremoſt Cliff-Land, or that thereby it get out of your ſight, you ſhall then ſurely ſail upon the foreſaid Rocks.

By St. *Margaret's*-Bay, upon the foreſaid Land, ſtands a Gentleman's Houſe in the Hills; when you have brought that with the Mill that ſtands within, one in the other, then you may go into the Road, and leave the Rocks which lie above Water half way over the Bay, either on the Starboard or Larboard of you; anchor there in 5 or 6 Fathom ſandy Ground.

About 2 Miles S S E. from St. *Margaret's*-Bay, off at Sea, lies a ſunken Rock called *Caliach*, which is dry at Low-Water.

To avoid it take Heed unto theſe Marks; when you come from *Carnaroot*, and have the *Trunchin* on with the great Iſland of *Saltees*, and keep them ſo, you ſhall go right upon this ſunken Rock: but to go to the Southward of it, keep the *Trunchin* and the ſmalleſt Iſland of the *Saltees* one in the other, or elſe to go to the Northwards of it; keep the *Trunchin* well open to the Southward of the great Iſland, and then you ſhall not need to fear any Danger of this ſunken Rock, but 'tis ſafeſt going without it.

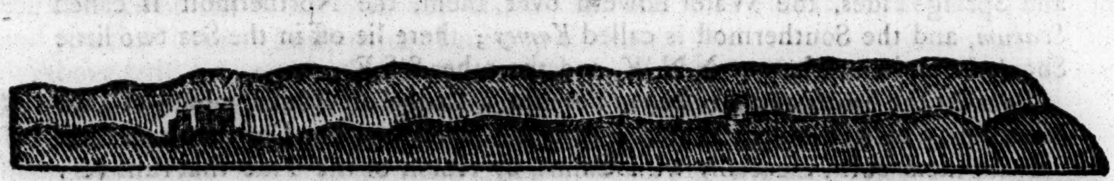
From St. *Margaret's*-Bay, to the Point of *Grenore*, the Coaſt lies N E. half a League.

The Point of *Grenore*, is not very high, but ſteep and flat at the Top; from this Point goes a Shoal about a quarter of a League E. by S. very full of ſmall ſtones, and at Low-Water dry.

Thoſe who come from the Southward, going for *Wexford* or *Dublin*, go in commonly betwixt the *Tuſkar* and the foreſaid Rocks of *Grenore*.

Coming out of the Sea, about a League or two, near unto *Grenore* Point, you ſhall ſee the high ragged Land above the ſaid Point, which (as aforeſaid) is not very high, cut flat at the Top: by that ſaid high ragged double Land within you may know the Entrance of the Channel of *Wexford*.

When you have ſight of *Grenore* Point, you may boldly ſail in with it, until that double Land ſhows it ſelf by Eſtimation, about a Man's Height above the Point of *Grenore*, as it is ſhewed in this Figure.



Then are you far enough from the Shore, and in no Danger of the Shoal of *Grenore*, or elſe come no nearer than 6 or 7 Fathom; but for need, you may borrow off the Shoal in 5 Fathom, or 4 and a half; but you muſt take Heed that you go not far off it, that you have more than 8 or 9 Fathom deep, otherwiſe you will come too near the Bank, called the *New-Ground*, which lies to the Northward of the *Tuſkar*, which on the inner-ſide is very ſteep too; for upon it is no more than twelve Foot Water, and cloſe by it 10 Fathom deep.

If you keep the aforeſaid ragged high Land, a Man's Height above the Land *Grenore*, and ſail to the Northward ſo long, until you bring a high Land without, or to the Northwards of the ſteep Point of *Grenore*, then are you yet right againſt the Shoal; and muſt continue ſailing to the Northwards, keeping the Mill that ſtands near to the Point of *Grenore*, ſo that you may ſee the Top of it over the Point when you keep it ſo, you ſhall not be in any Danger of the Shoal or Riff; and as ſoon as you ſee the Caſtle (which ſtands a little without the *Strand)* come without the Point of *Grenore*, then you may ſail boldly towards it, by your Lead, into the Bay of *Grenore*.

The ſaid Mill ſtanding upon the Land of *Grenore* a little within the Land, may ſerve for a Mark, not to come too near, as well to the Shore, as alſo to the Shoal or Riff; for if you come not ſo near the Shoal, as you loſe the Mill out of your ſight, but keep ſo far off that you keep in ſight of it, then are you far enough from the Shore, and from the rocky Shoal or Riff; and when the Mill comes to bear SW. and SW. by S. from you, you are paſt the Shoal or Riff; ſteer then NW. by W. and NW. (as the Wind and Tide ſhall be) into the Bay of *Grenore*. Or elſe you may obſerve another Mark; ſail on ſo long North until a long black Houſe come out to the Weſtward of *Grenore* upon the Land: Then you may Luff into the Shore in 4 or 5 Fathom along by the Riff, and run in ſo, until you get into 6 or 7 Fathom, and preſently afterwards into 8 or 9 Fathom deep, but afterwards it is Shoal by little and little as you come near the Shore: But if you have a large Wind, then ſail ſo long to the Northward, until you ſee another black Houſe come without the Point, ſail then into it, and you ſhall go clear of the Riff. In the Bay is Shoal Water, you may lie as near the Shore as you pleaſe, either in 6, 5, 4 or 3 Fathom, and there may you have a Pilot to carry you into *Wexford*.

To ſail out of Grenore-Bay *to* Wexford.

To ſail out of *Grenore-Bay* towards *Wexford*, with a Ship that draws little Water you may boldly run along the Shore, and ſail through betwixt *Haenman*'s Path and the *Sounder*; in the Channel (at ordinary Tides at High-water) is 8 Foot, but at Spring-Tides 10. The *Sounder* is the South Point of the Main Land of *Wexford* Haven. But if your Ship draw more Water than 8 Foot, you muſt (going out of *Grenore*-Bay) ſteer farther off the Shore, and go without *Haenman*'s Path, which is a dry Sand, and lies off the South Point of this Haven; but you muſt be careful you ſail not too far to the Eaſtward, leſt you fall upon the Banks, which lie without; therefore keep no farther off than in 10 or 12 Fathom, for theſe Banks are ſteep too. If you deſire to paſs to the Northward Sands, then obſerve this Mark. To the North of *Wexford* is a high Hill with a round Hommock, which is to be ſeen over the low Land, upon which ſtands a Caſtle a little above the *Strand*, appearing as it were againſt the Land; bring that Hommock a little to the North of the Caſtle; this Mark will keep you clear off *Haenman*'s Path, you may, if need require, upon a bare Wind, borrow ſo much as to bring them together, but if you ſhould open the Hommock to the Southward of the Caſtle, you cannot clear the Sand.

If it ſhould happen that you cannot ſee theſe forementioned Marks, then you may go about the Sands by your Lead in 7 Fathom Water without Danger.

Haenman's Path is a dry Sand, lying before the Haven of *Wexford*, and upon the North of it lies another Sand of the ſame bigneſs, called the North Ground; betwixt theſe two Sands is the deepeſt Channel going into *Wexford*, for you have 4 and 5 Fathom in this Channel; you may run in when a little Caſtle in the South-land, within the *Strand*, upon the South-end of the high Land of *Wexford*, is about 5 W. by W. from you; when you have brought it upon this Point, and that it is betwixt the two Northermoſt little

Sand-hills, that are upon the Foot of the *Strand* upon the *Sounder* (which is upon the South-ſhore) then are you paſt *Haenman*'s Path: Then you may ſteer over the Bar, where you will find at High-water 16 Foot; but keep to the South-wards, leſt the Tide force you upon the Tail of the North Ground, where the Maſt ſtands, which is the Fore-maſt of a Ship loſt there, and lies ſunken in the Sand: Where this Maſt ſtands, the Ground is very flat going up.

In this Channel, and upon the Bar, the Flood runs in after Half-tide ſtrong by the Channel to the Northward; ſo that when 'tis High-water in this Channel, and upon the Bar, there runs a ſtrong Tide to the Northward, which is ſuppoſed to be the cauſe of the Tail of *Haenman*'s Path, caſt up ſtill more and more to the Northward: So that this Channel lies more to the Northwards than it was wont to do, therefore you muſt keep cloſe to *Haenman*'s Path; and it is believed this Mark in Time will be of no uſe.

The Flood after High-water runs ſtrong Half-tide, or 3 Hours (in the Channel) to the Northwards, as alſo the Ebb Half-tide to the Southwards, but not ſo ſtrong as the Flood.

Being over the ſhoaleſt of this Bar, you ſhall have 3 and a half and 4 Fathom, as in the Channel, betwixt the North-Grounds, and *Haenman*'s Path, run over to the Foot-*Strand*, and then edge over to the North-ſhore, to avoid the Grounds which lie to the Weſtward above the *Sounder*; you may borrow off the Shoal, on the North-ſide by the Lead, in 10 or 11 Foot, according to the Draught of your Ship in the right deep; in your edging over, you have at Highwater 15 Foot. The Mark for this edging over is a white little Caſtle, which ſtands upon the North-ſide of the Haven, in the Valley of the Land; when that comes over the ſteep Point of the innermoſt Iſland of the two, which lies upon the North-ſhore, then you may boldly run in W. by N. and WNW. with it, until that little Chapel within the Land, to the Southward of *Wexford*, or about a Cable's length to the Northwards of that forementioned Caſtle, on the Northſide of that ragged high Land, which is a little to the Southward of *Wexford*: When you have brought theſe Marks one in the other, edge over then to the South-land upon the Marks, for then you are above the Sands of the *Sounder*, and in no Danger of the Point of that Sand which comes from the Paſſage-point; it is there ſo Broad, that you may turn to and again. It is altogether Shoal-water about ten Foot, or ten Foot and a half at High-water; ſailing upon theſe Marks, you will come about the Shot of a caſt Piece, without the Caſtle of *Wexford*, to the South-ſhore, ſail then in along by it, and keep in the *Soundings* of the Shore, until you come in the *Soundings* of the Caſtle, there you may anchor, and ſhall find about three Fathom Water. If you are not acquainted, 'tis beſt for you to remain there, for before the Town lie ſome ſunken rocks, right againſt the Key, or the Head of the Market; if you will lie there, keep a good diſtance off the Shore, becauſe of theſe Rocks, and go right againſt the Weſt-end of the Town, where you may anchor in 3 Fathom Water, or thereabouts.

To the Southward of the Sands, that lie to the Weſtward, or above the *Sounder*, goes a Creek through; there is more Water than in the edging over to the Northwards of the Sands, and the Mark to ſail there is, that you keep the higheſt Hommocks of the high ragged Land (behind *Wexford* right over the Caſtle of *Wexford*) but there can be nothing got by it, with ſailing through there, in regard you muſt nevertheleſs go over the ſhoaleſt, after you have paſſed the Sands of *Sounder*, to wit, over the aforeſaid depth of 10 and 11 Foot.

To ſail out from *Wexford* with a Ship that goes deep, you muſt not lade deeper than 10 Foot, or 10 Foot and a half to come over the aforeſaid Shoal; you ſhall then ſail about to the Northwards of the Shoal that lies within, or to the Weſtwards of the *Sounder*, and go in and anchor betwixt the Shoal and the *Sounder*; there you ſhall be Landlockt for all Winds, except for the SW. Wind, where you have but little ſhelter; you ſhall therefore bring out your beſt Anchor in the SW. and the other in the NE. for fear that the Winds that come out of the SW. over the Land, do put you upon the North-Grounds. There at the *Sounder* you may take in the reſt of your lading; it is a League from the Town.

If you will anchor before the Bar of *Wexford*, to ſtay for the Tide, you muſt anchor a little to the Northwards of the Bar, and go off ſomewhat until you have 8 Fathom; there it is clean ſandy Ground. In the Night there are two Fires made upon the *Sounder* for the Fiſhermen to come in by thro' the Channel by *Haenman*'s Path; he that will ſail in by them, muſt keep the higheſt Fire a little to the Southward of the other, to avoid the North-Grounds. Beſides the deep, along by *Haenman*'s Path, the Fiſhermen have a little Channel that goes out cloſe by the North-ſhore; it is thereabout ſix Foot deep at High-water.

From the Bar of *Wexford*, you may ſail E. by S. and W. by N. out and in, through betwixt the Banks into the Sea, or out of the Sea, that is a large and broad Channel: But to ſail within the Sands towards *Dublin*, you muſt keep the *Soundings* of the Shore, and run along by it, in 6, 7, or 8 Fathom, you ſhall ſo ſail along about a Cable's Length from the Shore, which is very clean, without any Danger, ſo that any man having but a little Knowledge of the Land may ſail there by Night, only you muſt take heed not to go farther from the Shore than in 7 or 8 Fathom, ſo that you may not come foul of the Banks, which are on the inner ſide very ſteep too. And to the Northwards along by the Shore, about 2 or 3 Leagues from the Bar, you ſhall ſee three white Spots or Rocks in the Sand-hill; a little to the Northwards thereof ſtands a piece of a Wall, much like a Pillar of a Church: Right againſt this Pillar, a great Mile from the Shore, begins a Sand called the *Ruſch* and *Ram*, lying from thence along the Shore to the Northwards: You may ſail about it on both Sides, but it is beſt to keep the Shore, and to run thro' there within 6 or 7 Fathom, as it is ſaid out of Fear of the outermoſt Banks, which are very ſteep, and therefore cannot be ſounded; therefore Men ſeldom ſail to the Eaſtward of the *Ruſch* and *Ram*.

Right againſt this forenamed *Ruſch* and *Ram*, the Shore makes a Bay unto the Point of *Donaghmore*, which is a low Point; a little to the Northwards of it ſtands a Caſtle. When you are without the Banks in the North Channel, and deſire to come within the Banks, then keep that Caſtle (if you can get ſight of it,) a little to the Northwards of the low Point, and run boldly right in with it, unto the Land without fear of the Grounds; there is a good Channel through the Banks, you ſhall not find leſs Depth than 15 or 16 Fathom, until you come to the ſhoaling up againſt the Shore. This Channel lies in WNW.

To ſail from *Donaghmore* to *Dublin*, run all along by the Shore, (which is ſomewhat full of ſmall Roads and Bays) and keep you as before in 8, 7, or 6 Fathom.

Two great Leagues to the Northward of *Donaghmore*, lies a Sand a great half Mile from the Shore, called *Glaſkerman*; the Ground is very uneven betwixt both: But nevertheleſs run thro' within that Sand, and keep the ſounding of the Shore, but not ſo far from it that you come into 10 Fathom; for then you ſhould ſail cloſe along by the *Glaſkerman*, which is very ſteep, and about two Miles long.

One League to the Northwards of the *Glaſkerman*, lies the Point of *Arklow-head*.

Sailing thro' between the Shore and *Glaſkerman*, to the Northwards, you may ſee two Points; to wit, *Mizen-head*, and to the Northwards of it *Wicklow-head*. If you keep *Wicklow-head* well within the Point of *Mizen-head*, then you can take no Hurt of the *Glaſkerman*. But if you would ſail without the *Glaſkerman*, then keep *Wicklow-head* a good way without the *Mizen-head*, and ſo run along a Sea-board of it, and you can take no Hurt: But if you keep the Point of *Wicklow-head*, but even without the *Mizen-head*, you ſail upon the *Glaſkerman*.

At the North Point of *Arklow-head*, lies a little ſtony Ledge; very ſteep too. You muſt take good heed of it coming from the Northwards, and bound to the Southward, and muſt come no nearer it than in 5 Fathom; towards the Shore lie ſome little Rocks above Water: When you come from the Northwards, and thoſe little Rocks are WNW. from you then are you paſt it, to wit, to the Southward of the Ledge: and then you may again burrow off the Shore upon that Lead. Commonly Men keep ſo far off the Shore that they can take no Hurt of the aforeſaid Ledge. At the North-ſide of the Point of *Arklow*, is a fair Sand Bay; there is good Anchor Ground, and all over good Riding, in 8, 7, or 5 Fathom: In this Bay are good ſtore of Herrings caught.

To ſail into the Channel before Arklow.

Right againſt *Arklow* runs alſo a Channel through the Bank into the Sea. To ſail in there, out of the Sea, look out for a round Hill within the Land; bring that WNW. or NW. by W. off you, and ſail then in there, boldly keeping it ſo; but if you bring the round Hill Weſt of you, and ſail ſo in, you ſhall ſail upon the Point of the North Ground. It is in that Channel about 7 or 8 Fathom deep.

About an *Engliſh* Mile to the Northwards of the Point, is the River of *Arklow* but very Shoal; at High-water there is no more than 6 Foot.

The Coaſt of *Wexford* unto *Wicklow* lies moſt N. by E. But he that will ſail without along by the Banks or Sands, muſt not go more Northerly than NNE. to avoid the Grounds which lie about *Wicklow*, three Leagues off from the Land. And to the Southwards, the South Grounds lie ſcarce a League from the Shore. There not long ſince a Pilot keeping bad reckoning, ran without the Sands along N. by E. and ſailed thwart of *Arklow*, behind a Tail of Sand that lies off from the North to the Southward, and loſt his Ship. *Arklow* lay from them (when they ſet upon the Sand) W. by S.

About one League and a half to the Northward of *Arklow*, lies *Mizen-head*, it appears black: Between it and *Arklow*, in the Fair-way, it is 8 and 9 Fathom deep; there is good Anchoring and clean Ground.

From *Mizen-head* to *Wicklow-head* is two Leagues and a half, and one *Engliſh* Mile to the Southwards of the Point of *Wicklow*, lies a little Rock cloſe by the Shore, called the *Wolf*; it is at half Tide above Water, the Fiſhing-Boats run through within it, but it is not to be done with Ships.

Right to the Southward of *Wicklow-head*, ſomewhat farther out than the Point, lies alſo a rocky Sand, called the *Horſe-ſhoe*, cloſe unto the Point; about S. by E. from it a Ship may, for Need (when you can do no better) ſail through within it, but you muſt be very well acquainted with it. If you keep the Point of *Bray-head* a liitle without *Wicklow-head*, then you can take no Hurt of it; or if you keep the high inner Land ſo that you may even ſee it above the land of *Wicklow*, then you go without it in 5 Fathom.

The Point of *Wicklow* is ſteep and ſtony, a little Hill with a double Top, within ſtands a little Chapel, when you can ſee that through the Saddle of the Hill, then you are right againſt it: The Village of *Wicklow* lies to the Northwards of the Point in the Bay; this is a little Haven, which hath in High-water 10 Foot.

In the Bay the Ground is ſo hard and chindly, that the Anchors do not hold; but without the Bay, a little farther from the Shore, toward the Banks, the Ground is ſomewhat better.

Thwart of *Wicklow* alſo is a Channel through the Banks for to ſail out or in; keep the Caſtle of *Wicklow* that you may ſee it open of the Point, thereupon you may boldly ſail out or in: or there is a Point of Land about a League to the Northwards of *Wicklow*, keep that on with a high Hill within the Land, called the *Sugar-Loaf*, (which will then bear about NW. a half W. from you) and that Mark will carry you in between the Sands, in 8 or 10 Fathom Water.

Four Leagues from *Wicklow* lies the Point of *Bray*, a high ſteep ſtony Point, and the higheſt Land thereabouts on the Sea Coaſt.

Betwixt *Wicklow* and *Bray* lies out a flat Point, with a little Fiſher Village, called *Newcaſtle*; there you have 4, 5, and 6 Fathom deep; but from the flat Point unto the ſteep Point of *Bray*, it is near 14 Fathom deep, the Land lies thereabouts North, and North by Weſt.

The *Sugar-Loaf* is the fartheſt in the Land of the three Hills, which they call the *Vineyards*; when you have them through one another, and are NW. and ſo keeping them, then may you boldly thereupon run through the Banks into the Sea, or out of the Sea, By theſe Marks you may come in within the Banks, that is a very large and broad Channel.

Thwart from the foreſaid *Sugar-Loaf*, to the Southward of *Bray*, lies a Bank that is no deeper than 4 Fathom, very ſtony and ſharp Ground.

Bray-head is very ſteep, likewiſe alſo the Ground by it is 10 Fathom deep cloſe by the Shore. To the Northward of the Point lies a little Tide Haven, there ſtand the Houſes called *Bray*, on the North-ſide.

From *Bray-Head* to the Iſland and Point *Dalkey*, (lying at the South Point of the Bay of *Dublin*) the Courſe is North 7 Miles, theſe two Points make a Bay,

The Sound betwixt the Iſland *Dalkey* and the Main, is called the *Sound of Dalkey*, it lies North and South through; it is in 7, 8, and 9 Fathom deep: You may Anchor under the Iſland, near the Land there is good ſandy Ground: Or ſomewhat farther in, there lies a round Rock, neareſt to the Main Land; there you may make faſt a Cable on it, and Anchor thwart of the Channel towards the other Rocks, becauſe of the Tides; the Tides run there very ſtrong through, a SSE. and S. by E. Wind, blows there right in; but in regard it is there very narrow, there can go no great Sea; with a SE. Wind you are Land-lock'd off the Iſland, and a S. Wind comes off the Main Land.

There is alſo another ſmall Iſland ENE. from the Eaſtermoſt Point of this Iſland, called *Moggul*; or by ſome the *Little Dalkey*, between which and *Great Dalkey*, is a Channel of 5 and 6 Fathom Water, but narrower than the firſt, and the Ground foul on both Sides.

From the Iſland *Dalkey*, until you are paſt the Village of *Dalkey*, the Shore lies NW. by W. before the Village you have ſome Succour for a SE. Wind, the Wind being more Eaſterly, you lie in the open Sea; you lie there in 8 or 9 Fathom, the nearer the Iſland the deeper; the Place is called *Berton Road*: You may not Anchor farther to the Weſtward than before the Village: To the Weſtward of the Village the Ground is foul and ſharp.

Directions to ſail clear of the Grounds.

The Sands or Banks that lie along this Eaſt Coaſt of *Ireland*, from the *Tuſkar* unto *Dalkey*, are on the out-ſide, or on the Eaſt-ſide very ſteep too, ſo that you muſt come no nearer than in 24 and 25 Fathom; in 20 Fathom you are cloſe by them: In ſome Places they have but 6 or 8 Feet Water, but at the North-end by *Dalkey*, about 2 Fathom and half and 3 Fathom deep, all ſtony Ground, and lie along the Shore, N. by E. and S. by W. At the North-end they lie about 8 Miles from the Land.

If you are bound for *Dublin*, and will go without theſe Sands, run then ſo far to the Northwards, until you can ſee a little Iſland, (*Ireland's Eye*) without the Point of *Heath*, and then you may run into the Bay without Danger.

Of the Tides and ſetting of the Currents.

Before *Waterford*, an E N E. Moon, but at the Town, an E by N Moon, makes full Sea.

In the Channel or Entrance of *Wexford*, an Eaſt and Weſt Moon.

The Flood runs there to the Northwards, after High-water at half Tide, and the Ebb contrary-wiſe to the Southward, at half Tide after Low-water, but not ſo ſtrong as the Flood.

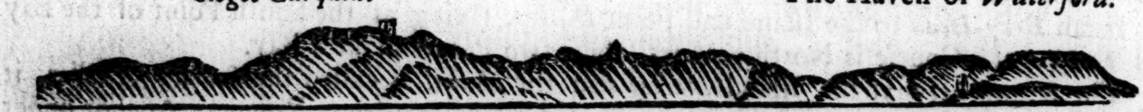
On the Eaſt Coaſt of *Ireland*, to the Southwards of *Dublin* Bay, a S S E. and N N W. Moon, make High-water.

At *Carlingford* and *Dublin*, a S E. and N W. Moon: But in the Bay, S E. by E. and N W. by W.

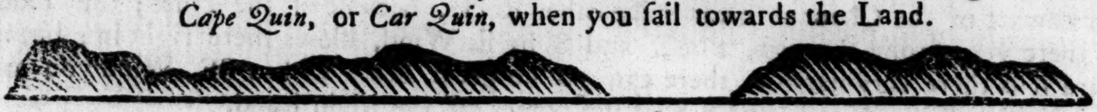
The Flood runs from the *Tuſkar* without the Banks, along betwixt *Ireland* and *England*, N N E and the Ebb S S W.

On the Coaſt, a S S E. and N N W. Moon, make High-water.

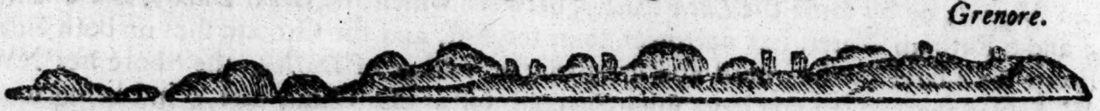
The Flood comes here from the Southward, and alſo from the Northward, about the North Part of *Ireland*, and meet one another right againſt *Carlingford*, where they ſtop one another; (the Ebb contrary-wiſe ſets to the Northwards of *Carlingford)* to the Northward and Southward of *Carlingford*, to the South.


Sleges Carquin.
The Haven of *Waterford.*
The Tower of *Waterford.*

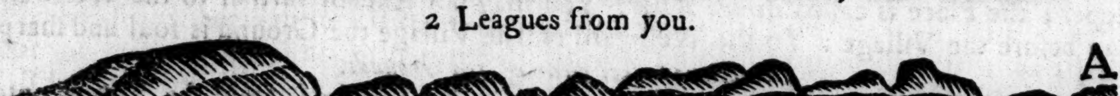
Thus ſheweth the Land about *Waterford*, to the Weſtward, with the High Hand of *Cape Quin*, or *Car Quin*, when you ſail towards the Land.



Thus ſhews the *Saltees*, when it is 3 or 4 Leagues Weſt by North from you.



Thus ſhews the Land between the *Saltees* and *Grenore* Point, when it is about 2 Leagues from you.



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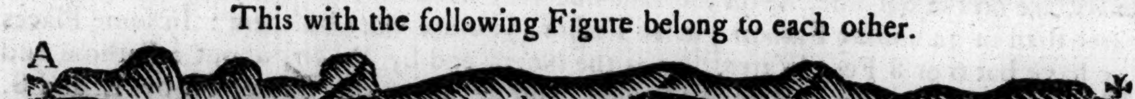
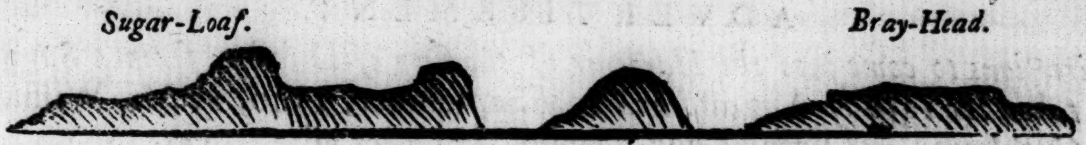
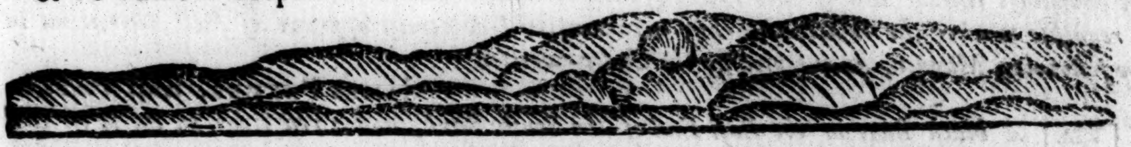


Thus ſhews the Land to the Northwards of *Grenore*, when the Northermoſt Point, where the Croſs ſtands over, is N by W. about 5 Leagues from you and *Grenore*, S W by W. ſo far that it can be but ſeen from the Deck, then may you ſee *Tuſkar* from the Top in the S W.

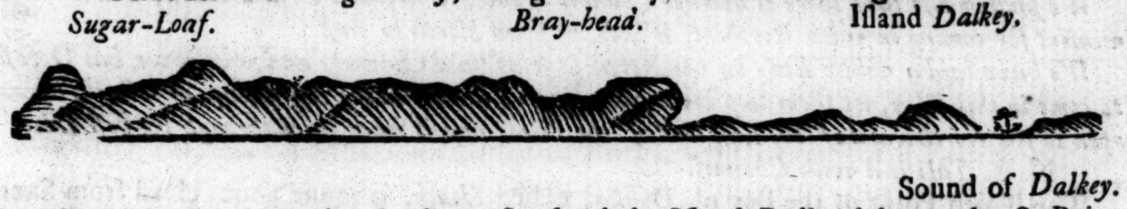
Sugar-


Sugar-Loaf.
Bray-Head.

Thus ſhews the Coaſt when the *Sugar-Loaf* is N W. and the Point of *Bray-head*, N W. by N. about 7 Leagues from you. When the *Sugar-Loaf* comes N. W. half Weſt from you, then you may run ſo in over the North-grounds, through a broad Channel 9 or 10 Fathom deep.



Thus ſhews the *Sugar-Loaf*, being thwart you within the high Land.


Sugar-Loaf.
Bray-head.
Iſland Dalkey.
Sound of Dalkey.

Thus ſhews the Land betwixt the *Sugar-Loaf* and the Iſland *Dalkey*, lying at the S. Point of the Bay of *Dublin*, when you are about *Bray-head*, one or two Leagues from the Shore.

Marks of the Shoal called the Keſh, *as taken the* 31*ſt of* Auguſt, 1747, *viz.*

WHEN the *Big Sugar-Loaf Hill* is in the Valley of *Bray-Head*, and bears then W. S. W. of you, and the high Land of *Dalkey* W. by N. half N. the End of the Piles N W. the Light-houſe on *Howth* N N W. and *Ireland's Eye* open and ſhut with the Head of *Howth*, you have 10 Feet Water at one Hour's Flood on Neap-tides (*Lambay* North-Eaſterly.) This Bank reaches at leaſt two Cables in Length, from the S by W. to the N. by E. with very little Difference in the Depth of Water, but is very narrow, ſo that from Eaſt to Weſt it is not above 15 or 20 Fathoms broad; but it is not ſafe to come nearer to it, either within the Bank or without, than 7 Fathoms Water. We dropt the Pearch at the North End of this Shoal, in 18 Feet at High-water Neap-tides, near 3 Leagues from *Dalkey*.

N. B. This Ridge of a Bank reaches to the Northward ſo far as to bring the Piles End to bear W N W. and there you have 4 Fathoms and an half at High-water; but there is in ſome Places between this North End, and where the Perch is on the *Keſh*, ſix Fathoms Water at High-water. At the North End of the Bank, as above, *Ireland's Eye* is quite open of *Howth*, and the Light-ſhip at the Piles End is W N W. when you have 4 Fathoms and an half at High-water, Neap-tides.

ADVERTISEMENT.

Directions to come into the Harbour of the City of Dublin, *from a Survey taken the* 14*th of* Auguſt, *and* 20*th* September, 1740, *by Mr.* William Cuthbert, *and* Francis Mc. Daniel, *by Order of*

JAMES PALMER, Eſq; *Patentee.*

*W*Hereas the underwritten Perſons have by my Direction, at ſeveral Times Surveyed and Sounded the Channels of the Harbour of the City of* Dublin, *whereby it is evident that the Soundings thereof are of late Years greatly altered, in ſuch Sort, as I have thought it highly requiſite to alter the Water Marks; accordingly, I do hereby approve of ſuch Alterations in the following Manner, as executed by the Under-written*

JAMES PALMER, Eſq; *Patentee.*

[Viz.] *A black Buoy on the Eaſt End of the South Bank, and a red Buoy on the Weſt End of ſaid Bank, which makes the Channel at the Piles End.*

We finding alſo that there is another Channel to the Northward of ſaid Bank, and more convenient for coming in with Northerly Winds, or from North to Eaſt;

We have laid a white Buoy on the North Side of ſaid Channel, and whoſoever has Occaſion to come in this Way, let them keep Iriſhtown *Church Steeple on the Light-ſhip, or a Sail's breadth open to the Northward of the Eaſt End of the Piles, and it leads them through the beſt Deep.*

N. B. *This is a wide Channel.*

The North Point of the Bay of *Dublin*, called *Hoath*, is round about clean from Sands, ſo that a Ship may Anchor in any Place about it, except a Cable's Length off the South Point, but almoſt all round it cloſe to the Shore, it is foul and rocky, it is a ſmall Shoal of four Fathom Water; to the Northwards of it lie the Iſlands of *Ireland's-Eye*, and *Lambay*; *Ireland's-Eye* is the ſmalleſt, it lies betwixt the aforeſaid Points of *Hoath* and *Lambay*; at the Weſt Side of it ſtands a little Chapel, right againſt which you may ride; at the South End lies off a ſtony Riff, which muſt be avoided; on the Eaſt is a high Rock, called the *Stags*.

Right over aginſt the Iſland, in the Main Land, lies a Haven for ſmall Ships, at a little Town called *Maſchael*.

Under *Lambay* you may ride upon the North Side, for Southerly Winds, in 12 or 13 Fathom, but for a Sea-wind, you muſt ſhift unto the Weſt Side, by a Gentleman's Houſe, and Anchor there; but it is not very good lying there, becauſe always there comes in a great Sea.

About 7 Leagues NNW. from *Lambay*, lies the Haven of *Drogheda*, betwixt them both (neareſt *Lambay*) cloſe by the Land, lie Rocks, called the *Skerries*; *Drogheda* hath a narrow crooked Haven, which is not good to come into without a Pilot, or ſome one that is well acquainted with it.

About 4 Miles to the Northwards of *Lambay*, lies a great Rock, called *Rock Abell*; you may run round about it on both Sides: And 6 Leagues to the Northward of *Drogheda*, lies the Haven of *Dundalk*, which is very Shoal, and little uſed; at Low-water a Man may go over on Foot.

Three Leagues Eaſt from *Dundalk*, is *Carlingford*, one of the beſt Harbours in *Ireland*; it is 3 Leagues in Length, and 2 Miles in Breadth in the narrow Place, being very deep, ſo that the biggeſt Ships may come here to Anchor, and ſo invironed with high Sands and Mountains, that they may lie defended from all Winds; and if it were not for the Difficulty of its Entrance, would be one of the beſt Harbours in the World.

The Mouth of this Harbour is 2 Miles and a Half wide, where you paſs over a Bar or ſhoaler Water, on which you will find 9 or 10 Feet at Low-water, the common Tides riſe 10 or 12 Feet at the Neap-tide; the Shore is very foul at the Weſt Entrance, ſo that there is no Paſſage to the Weſtward of the Iſland, called the *Haubouling*, which lies at the Entrance of this Harbour, but betwixt this Iſland and the Eaſt Shore, you have (after you are over the Bar) 7, 15, and 20 Fathom, but come no nearer the Eaſt Point than 3 Fathom, or the Iſland than 7, for both are foul and rocky. This Channel is about a Mile and a half over; you muſt (after you have paſſed this Iſland) keep the middle of the Channel, and ſteer over to the Weſtern Shore, leaving *Guerne-Iſland* on the Starboard; ſailing betwixt that and the Main, you have a very fair and deep Channel of 7 and 8 Fathom. Give not *Grenore* Point too great a Birth, for about half a Mile North Eaſt from this Point is a Ledge of ſunken Rocks.

Betwixt this Point and *Carlingford*, the Shore runs in with a deep Bay, but is very foul and rocky; therefore keep your Courſe NW. about two Miles and a half, and you may come to Anchor at *Carlingford-road* in 6 or 7 Fathom, and ſo near the Shore in leſs Water, as you pleaſe, until you put your Ship aſhore on the ouſey Ground, and be ſafe without either Anchor or Cables; four Miles farther, at the bottom of this Harbour, is the Entrance of *Narrow-water*, or *Newry-water*, where you have 3 Fathom. Five Miles up this River is the Town of *Newry*, a fair Town. This River is not paſſable but for ſmall Barks or Boats.

From this Bar, Eaſt 4 Miles, is a Ledge of Rocks, which have but 8 Feet Water over them, but betwixt theſe Rocks and the Main, is a fair Paſſage of 8, 10, and 12 Fathom,

From this rocky Ledge, N. by E. half Eaſterly, 5 Leagues, is the Haven of *Dundrum*, good and ſafe, though ſmall.

From *Dundrum*, Eaſt 2 Leagues, is St. *John*'s Point, to the North of which is the ſmall Haven of *Arglas*.

Five Miles from *Arglas*, NE. by N. is the Haven of *Strangford*, whoſe Entrance on the Weſt Side, is foul and rocky; four Miles up this Harbour, on the Weſt Shore, is the Town of *Strangford*, at the Mouth of a great Lake, called by that Name, but by ſome *Lough Cone*; this Lough is 14 Miles in Length, and 3 Miles broad in moſt Places. It ebbs and flows through this Harbour which cauſes a great Tide.

From the Mouth of this Harbour the Courſe is NNW. until you come to *Portaferry*; in your way you have a Ledge of ſunken Rocks, which ſhew themſelves at Half-tide; you muſt ſail between them, keeping the middle Channel; ſomewhat farther you will ſee another Shoal of Rocks by the Eaſt Shore, which you muſt keep on the Starboard going in, when you are ſo high as *Portaferry*, which is a Village on the Eaſt Side a little above *Strangford*, above which is a Road, called *Ballyhalbert*; before this Road is a Rock which is covered at High-water.

When you come up with the Flood, and are ſo high as to bring the Saddle or Lowland between two Hills (which is upon the Weſt Shore) oppoſite to you, then run in, and come to an Anchor with your beſt Bower, and Moore aſhore with your ſmall Bower; there you may Anchor in four Fathom Water, but be ſure you come not too near, which is very foul Ground round about it.

About a League and a half from the Harbour of *Strangford*, ENE. lie the Rocks, called the *North* and *South Rocks*.

From the South End of the *South Rocks*, lie a Ledge of Rocks, at leaſt a Mile and a half off, and from the NE. End another Ledge NE. off into the Sea.

The *North Rock* is a great Plat of Rocks, which ſtretches from the Land NNE. at leaſt a League, whereof many are not ſeen at High-water; ſo that a Ship can hardly ſail between theſe Rocks and the Main, except you be extraordinarily acquainted; but betwixt the North and South Rocks, there is a broad Sound, in which you may turn to and again, and come to an Anchor in many Places: It is good, clean, and fair Ground, and 6, 7, or 8 Fathom deep.

From the *South Rock*, NNW. 2 Leagues, lies a Shoal, but come no nearer than 8 Fathom. There is a Channel to the Weſt, but not much frequented. From this Shoal NNW. about 5 Miles, is the Rock called the *Plow*; it is ſeen at half Tide.

The *Plow Rock* in *Ballywater*, half a Mile from the Shore; in going out to ſhun this Rock, take theſe Marks: Give the Shore a good Birth, about a Mile, when *Grimſport* Quay is with an old Houſe with the Top or Roof off, and two other Houſes with Roofs on; I ſay when the Quay is within theſe Houſes, then are you a-breſt of the ſaid Rocks; then muſt you have the Foreland about a Ship's Length without the *Black Point* that ſhoots from the Main, that is, upon the Weſt Side of the *Sound*; the *Sound* lies NW. by N. and NNW. through.

The *Bureal* is a ſmall Iſland which lies near the Shore, half way between the *North Rock* and *Ballywater*; the *North Rock*, and *South Rock*, are about a Mile and a half aſunder; the *North Rock*, from *Copeland*, is N by W. and NNW. about 5 or 6 Leagues.

From the *Plow* to *Copeland* Iſland, going into *Carrickfergus*, is 8 Miles NNW. This Iſland lies 2 Miles from the Main, on the Weſt Side of it, (about 3 Quarters of a Mile NE. from a low flat Point) lies a ſunken Rock, about 3 Feet Water upon it, but you may paſs between this Rock and the flat Point without any Danger. Within *Copeland* Iſland is a very fair Channel of 7 or 8 Fathom Water; but come not too near the Main for it is very foul.

In going to the Northward through the *Sound*, between *Copeland* and the *Main*, when you are paſt the *Sound*, you muſt be careful you keep not too near the *Main*, for from the next Point there lies a ſunken Rock, about a Quarter of a Mile from the Shore.

North from the *Copeland* you have two ſmaller Iſlands, the one is called *Croſs*, the other *Mew*, the latter is very low; betwixt the *Copeland* and theſe Iſlands, is a Channel (near a Mile in Breadth) of 8 Fathom Water.

From this Channel to *Carrickfergus* (which gives Name to this great Bay or Lough) upon which it is ſituated, the Courſe is W by N. half Northerly three Leagues. This Bay is in Breadth at the Entrance 6 Miles, growing narrower by Degrees, until it comes to *Belfaſt*, which is ſituated in the Bottom of the Bay; and at this Place is about 3 Quarters of a Mile broad: From *Belfaſt* to the Mouth of this Bay is 15 Miles.

Carrickfergus is ſituated about 6 Miles in the Bay, on the North Shore, before which is a reaſonable good Road; the Town being accommodated with a Pier, but dry at Low-water. A Mile S. by W. from this Place in the Road, is a Sand Bank of 9 Feet at Low-water, on the North and South is 2 Fathom, farther out 3, in the middle of the Road 5.

From *Carrickfergus* to *Carmoyle* Road, the Courſe is SW. 5 Miles, but by Reaſon of the *Spit*, which runs from the North Shore, your better Courſe is to run up almoſt the length of the *White-houſe*, then will you bring *Caſtle-Rock*, which ſtands upon the Top of a Hill on the Eaſt Shore (a little above *Carmoyle*) upon a ſmall Village which ſtands cloſe by the Water Side; then may you ſail two Thirds over, and bear into *Carmoyle*. If the Weather be foul and heaſy, ſo that you cannot ſee theſe Marks, then may you ſail near the *White-houſe*, in 4 Fathom at Low-water; ſteer away SSW. until you come 2 Thirds over, and bear away SW. which will bring you to *Carmoyle*, where you may Anchor in 3 Fathom at Low-water, but higher up ſhoaler Water. *Note*, that the Channel which goes from *Carmoyle* to *Belfaſt*, has, on the Weſt Side ſeveral Poles or Beacons to direct how the Courſe winds and turns in this good Ground; but ſo full of Weeds, that if your Anchor ſhould trip or come home, it will be ſo clogg'd, that it will not eaſily take the Ground.

A little to the North of this Bay is a Caſtle, called *Mouſe-hill*'s Caſtle, where is a ſandy Bay, where either a great or ſmall Ship may ride ſafe from N W. Winds, but a SW Wind makes a bad Road.

From the North Point of *Carrickfergus* Bay, you muſt ſteer NNE. four or five Leagues, to keep clear of the *Maidens*.

Two Leagues to the North of the Bay of *Carrickfergus*, lies the Harbour of *Old-fleet* or *Larne*. For to know it, when you come from the Northwards, you will ſee 2 flat Towers, one ſomewhat higher than the other, like a Ship with a Main-ſail and Fore-ſail, without Top or Top-ſails, theſe are upon the North Side of the Bay.

At the South Point lies a ſmall round Iſland, called the *Knee*; a good Mark to know this Bay: You may run in the midſt of the Channel.

If you come from the Southward, and get Sight of *Knee* Iſland, you muſt beware of a Rock, called *Hunter's Rock*, upon which is but two Fathom at High-water: To ſail clear of this Rock, you muſt keep *Knee* Iſland cloſe with the *Main*, then are you without it; but if you keep the Iſland open with the *Main*, then are you within it; and when *Brown*'s Point on your Larboard-ſide going in *Larne*, is oppoſite to the Caſtle *Caran*, then are you oppoſite to the Rock; and when the Rock of the Mountain of *Ballegally* is right with the Middle of *Ballegally hill*, then are you right upon the Top of it, and you will ſee the ripling of the Sea upon it: You may run in about the *Knee* into the Harbour without any Danger.

The *Maids* lie North by Eaſt from the Bay of *Carrickfergus*, two Leagues and a half; they are great Rocks that lie a little above Water, or low rocky Iſlands, and a multitude of Rocks under Water about them; they lie ſo far NNE. that it is dangerous to come near them by 5 or 6 Miles: There are ſome Paſſages betwixt them, which for need might be ſailed through; but it's no Wiſdom to attempt it, where there is no Occaſion; thoſe who come from the North, muſt ſail SE by E. to clear them.

From *Old-fleet* to *Fair-Foreland*, is eight Leagues N W. Northerly: This Coaſt is fair and clean, ſo that you may ſail cloſe along by it boldly without fear, to the Weſt of *Fair-Foreland*; ſo that a Ship may Anchor every where in 8 or 9 Fathom under this Point of *Rathlin*, free from Eaſterly Winds.

A little off the Promontory of *Fair-Foreland*, to the North-weſtward, lies the Iſland of *Rathlin*, where Ships may ſail round about, as well on the outſide, as betwixt it and the Land, according as the Wind and Tide ſerves: On the South Side is a fair Bay, with very fine ſandy Ground, where Ships may ride defended from all Winds: When you come from the Weſtward, it ſeems to the Southward to be cloſe, without any opening; on both Sides of the Shore it is flat and clean, ſo that you may Anchor where you pleaſe. Within the Iſland of *Rathlin* on the *Main*, is a ſmall Iſle, called *Sheep*'s *Iſle*; you may paſs betwixt it and the *Main* without any Danger, only at the Weſt are a Ledge of Rocks, but a good Channel betwixt them and the Shore.

From *Rathlin* Iſland to *Skerres-Port-Ruſh*, the Courſe is Weſt by South, four Leagues; about two Miles to the Eaſtward of *Port-ruſh*, lies a Shoal called the *Chickens*, between which and the Shore there is forty Fathom Water, and to the Eaſtward of it fifty, but it is not ſafe for Strangers to come within it, by Reaſon of the ſunken Rocks that lie between it and the Shore; but for thoſe that are acquainted, there is good ſailing on either Side of it.

About 2 Leagues and a half to the Eaſtward of *Port-ruſh*, upon the *Main*, lies *Port-Ballentoy*, a bad Road for great Ships; the Ground there is very foul and ſharp.

Skerres-Port-ruſh is a rocky Iſland; it hath on the South Side a fair Bay, where you may ride in 6 and 7 Fathom Water, clean ſandy Ground, land-lock'd from all Winds, except ENE. which blows along the Shore open in.

A little to the South-weſtward of *Skerres-Port-Ruſh*, lies *Bann* Haven, which is the Mouth of *Bann* River, which falleth here into the Sea, keeping her own narrowneſs. The Water of this River comes out of *Lough Neagh*, the greateſt Lake in *Ireland* (which receives many Rivers) and having no other out-let into the Sea but *Bann*, carries a mighty deal of Water, which being incloſed in ſo narrow a Compaſs, that it pours itſelf into the Sea with great Violence; for which Reaſon this Haven is ſo very hard to enter, having alſo but little depth, ſo as that Veſſels which draw 8 Feet Water, muſt at leaſt have 3 Quarters Flood, before they can enter this River, to ſail up to *Coleraine*.

Three Leagues N W by W. from *Bann* Haven, and W by N. from *Skerres-Port-ruſh*, lies the N W. Point of the Entrance into *Lough-foil*, which is of a great Bigneſs, almoſt 12 Miles long, and in the middle 5 or 6 Miles broad; at the Ends it is but narrow: At the Mouth, between *Magillion*'s Point and *Green-caſtle*, is about a Mile broad, and at the other End much narrower: Upon this Arm, 4 Miles from the great Lake, is *London-derry*, a very handſome Town, the Streets being broad and well pav'd; the Houſes ſome Stories high, and built for the moſt Part of Freeſtone, with a handſome Church, Market-place, and Key, and is incloſed with a thick and very ſtrong Wall, being one of the principal Fortreſſes of *Ireland*: It is but a few Years old, being built by a Company of *London-Adventurers*, in the Reign of King *James* I. Before the Mouth of this Harbour lies a great Bank of Sand, called the *Tuns*, which lies from the Eaſt Point of the Haven, which extends it ſelf 2 Miles to the Northward off from the Shore. When the Wind is out, the Sea breaks very much upon it.

Small Ships which draw little Water may ſail into *Lough-foil*; to the Southward of the *Tuns*, betwixt the *Tuns* and the E. Point, but it is very narrow at full Sea, has no more than 18 Feet Water; but along the *Tuns*, or betwixt the *Tuns* and the W. Shore 'tis very deep, where there is at all Times 14 and 15 Fathom Water, and againſt the *Magillion*'s Point 8 or 10; when you are about a Mile and a half within, you will have 2 Channels, one along the Shore, and another runs South; the latter hath 9, 8, and 7 Fathom, but is not the right Channel; for your proper Channel is that along the Shore.

For to find the Channel that lies into the Weſtward of the *Tuns*, (coming from the E. or along by the *Tuns*) you muſt look out for a little ſandy Bay that lies on the W. Side, even within the N. Point of the River under the high Land, bring it ſo that you may ſee it open of the aforeſaid N. Point, and ſail in thereupon, until you come by the Land, and then run in along by it S W. until you come right againſt *Green-caſtle*.

If you come from the W. or the N. you may boldly, without fear, run along the Shore, and about the Point upon your Lead, without coming near the Town, you may ſee any Thing that may do you hurt: Coming by *Green-caſtle*, there you may anchor, ſo that you may ſee *White-caſtle*, without the Point of *Green-caſtle*, there you may lie ſafely.

For to ſail up from *Green-caſtle*, you muſt run up along by the Weſt Shore by your Lead, and ſhun an Oyſter Bank that is on the Weſt Shore, which begins about *Red-caſtle*, and ſtretches along the Shore, until you come to the 3 Trees; there is the ordinary Road where Ships come to Anchor.

When you ſail out of this Road towards *Culmore-Caſtle*, which is upon the W. Point of the Entrance of the River which goes to *London-derry*; you muſt keep the W. Shore aboard, to prevent the falling into a ſmall Swatch or Channel on the Larboard-ſide, which has often been taken for the right Channel.

How to ſail from the foreſaid Road forth up unto *London-derry*, you may be informed from the Chart it ſelf.

To ſail out of this Harbour clear of the *Tuns*, you muſt take no more of the Ebb than the laſt Quarter, for that runs NNW. the firſt Quarter running right over the *Tuns*; and if you are not very careful it will draw you upon them; to prevent this, ſail out NNW. and when you have opened the Head of *Coldoff*, then are you paſt them; run NE. by E. to clear the Head of *Rathlin*.

From *Lough-foil* Haven, unto the Iſland *Enſterhull* (by ſome called *Monſterhull*) the Courſe is WNW. 4 Leagues; theſe are ſmall black Iſlands, or Rocks, not very high above Water, and lie a little off the Northermoſt Point of *Ireland*, called *Emiſthone*, a high plain Land, and very good to be known for him that hath once ſeen it.

Betwixt the Iſland and the Point, you may ſail through, but not without great Danger for them that are not very well acquainted with it, becauſe there lies off much ſoul Grounds and Shoals betwixt them both.

Under the aforeſaid Point *Emiſtone*, on the Weſt-ſide, you may anchor for Eaſterly Winds, or elſe ſtop the Tide.

Of the Tides, and Setting of the Currents.

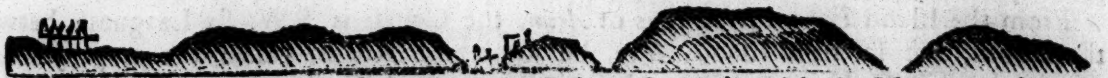
At *Dublin*, a S E. and a N W. Moon make full Sea.

The Flood comes here from the Southwards, and alſo from the Northwards, about the North-part of *Ireland*, and meet one another right againſt *Carlingford*, where they ſtop one another. The Ebb falls (to the Northward of *Carlingford*) to the North, and (to the Southward of *Carlingford*) to the South.

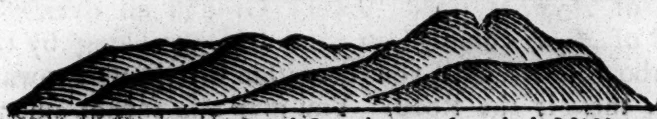
On the Coaſt of *Ireland*, from the *South-Rock* and *North-Rock*, unto the *Copeland* Iſles, a S S E. and N N W. Moon make full Sea; but to the Northward of it a S E. Moon.

On the Iſland of *Rathlin*, and *Skerres-Port-Ruſh*, an ESE. and WNW. Moon. The Flood comes there out of the W. and ſets through betwixt *Ireland* and *Scotland*. From Cape *Cantire* to the *Mull* of *Galloway*, SSE. unto the *Iſle of Man*, there the Floods out of the S. and N. do meet one the other. The Ebb falls along the Coaſt N N W. betwixt *Ireland* and *Scotland*, to the Weſtward unto the main Ocean.

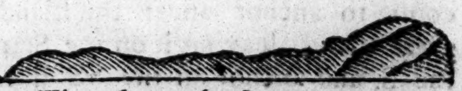
At *Egleſtone* in the *Sound* of *Glaſgow*, a S W. Moon makes full Sea. The Flood comes there out of the W. and N W.



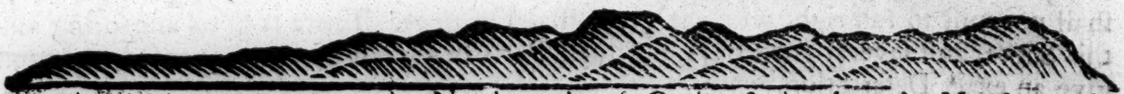
Thus ſhews the Bay of *Dublin*, with the Point of *Hoath*, with the Iſland *Lambay* to the Northward of it, when you come from the Southward.



Thus ſhews the Iſland *Lambay*, when it is NW. a League from you.



Thus ſhews the Land a little to the Southward of *Carlingford*, when this big Point is N W. from you about five Leagues.



Thus ſhews the Land to the Northwards of *Carlingford*, when the Northermoſt Point is N. by W. from you 5 or 6 Leagues.

A Deſcription of the North-weſt *Part of IRELAND.*

From Lough-Swilley *to* Slyne-Head.

FRom the Iſlands *Enſterhull* unto *Lough-Swilly*, the Courſe is WSW. 4 Leagues, it is a moſt famous Harbour, it is able to contain ſome hundreds of Ships, that may all ride in deep Water, and defended from all Winds, it is 18 or 20 Miles in Length, and above a Mile over in moſt Places. This Haven is little frequented, by reaſon of no Traffick in thoſe Parts, there being no good Town near them. To ſail in here, you muſt ſhun the Weſt-ſide, and go in along by the Eaſtern Shore. The Land about *Lough-Swilley* is the higheſt Land of the whole North Coaſt of *Ireland*, and thereby it is alſo very good to be known, for thoſe that (coming out of the *North*) do fall in with the Lands thereabouts.

Four Leagues WSW. from *Lough-Swilley* lies a large broad Haven, called *Sheep*'s-*Haven*; but it is at ſome Places foul Ground, where you may be Landlocked for all Winds; but this as well as the other, for want of Traffick, is not frequented; the Weſt Point of it is called *Horn-Head*, or *Cape de Horn*; upon it is a Hill with 2 Hommocks, in faſhion like 2 Horns, which give the Point its Name; and at the Weſt-ſide of this Point is a deep Bay, where Ships may ride and anchor within the Rocks for Eaſterly Winds, alſo betwixt *Lough-Swilley* and *Sheep's-Haven*, lies a Bay where a Ship may anchor, but the Ground is not very clean; and right againſt it, in the *Offing*, half a League from the Land, lies a Ledge of Rocks, which at High-water are under and at Low-water lie above Water. You may (for need) run thro' betwixt it and the Land, but without it is beſt and ſureſt.

About 2 Leagues W. by N. from *Cape Horn* or *Horn Head*, lies the Iſland of *Tory*; to the Southward of it lie 4 Iſlands called the Iſlands of *Balleneſs*; the Northmoſt is called Iſland *Beg*; the next *Doway*; the third *Boſin*; the innermoſt *Maghere Walley*. You may ſail through to the Southwards of *Tory Iſlands* betwixt it and the Iſland of *Balleneſs*, and alſo within the Rocks. Betwixt this Iſland and *Balleneſs*, is a good Road, where you may anchor ſafe from a Southerly or Eaſterly Wind.

From the Iſland *Tory*, to the Iſles of *Aran*, the Courſe is SW. ſix Leagues; betwixt them both, not far from Iſland *Aran*, lie ſome high Rocks, called the *Stags of Aran*; within them is the Haven of *Dore*; by the *Dutch* called *Klady*; it is a dry Harbour with many Iſlands off it; betwixt theſe Iſlands and the Shore, and along all that Coaſt, betwixt *Horn-Head*, and the Iſland of *Aran*, is good Anchor Ground all over. To come to anchor under the Iſland of *Aran*, coming out of the N. run along by that great Iſland, leaving it on the Starboard-ſide, until you be within it; go then towards the S. and anchor on the SE. ſide, there is the Road. You may alſo anchor amongſt the Iſlands over againſt it towards the Main, in divers Places landlock'd for all Winds.

Upon the NW. point of *Ireland*, a good way in the Land, lies a high Hill, almoſt like a Sugar loaf, which is ſeen in clear weather before any other Land, at leaſt nine Leagues at Sea; when that Hill lies E. by S. from you, then ſail right with it, you ſhall not miſs to fall right with the great Iſland of *Aran*. There is good anchoring along this Shore, and ſeveral good Bays, but theſe Parts being not much frequented, we cannot give an exact Deſcription.

To the Southwards of the *Cape de Telling*, betwixt it and the Stags of *Broad-Haven*, lies the Land with a great Bay, wherein are many good Havens, as *Telling-Haven*, *Kilbegh*, *Dungal*, *Ballas-Haven*, *Sligo*, *Andrego*, and *Moyle*.

From the Iſle *Aran* to the Iſland *Rathlingen*, which lies off of Cape *Telling*, it is SSW. 7 Leagues betwixt it and the Main, you may ſail without any Danger.

Telling-Haven is a round Bay, ſandy Ground, which will contain above 30 Ships, a good Road from the Weſt to the ESE. Winds.

From Cape *Telling* to *Kilbegh*, lies the Coaſt E S E. about 4 Leagues. *Kilbegh* is a fair round Bay, where the greateſt Ships that ſail upon the Seas may enter, and come to an Anchor. The Entrance is very narrow, ſo as to them that are coming to it, there ſeems to be no Opening, until you are very near. It is very clean, as well in the Mouth, as in the Bay, ſo that nothing can hurt Ships either ſailing out or in. Being entered, you may anchor in 5, 6, 7 and 8 Fathom, or more, as ſhoal and deep as you pleaſe; within on the North-ſide of the Bay, ſtandeth a Caſtle. About half a League to the Weſtward of this Bay, a quarter of a League from the Land, lies a little Iſland, which is very low and plain at both Ends, going plain down; that is a good Mark to know this foreſaid Bay. You may alſo ſail through betwixt the Iſland and Main, if you will.

Five Miles to the Eaſtward of *Kilbegh*, is a Point called St. *John*'s *Point*, ſtretching itſelf far into the Sea; right W. from that Point a Mile, lies a great Rock under Water, whereon the Sea breaks with a great Noiſe. Betwixt that Rock and St. *John*'s *Point*, you may ſail boldly through; it is there clean and clear. Betwixt theſe two Points, *viz.* the Eaſt-point of *Kilbegh-Harbour* and St. *John*'s *Point*, is a Bay called *Mark-Swain*'s *Bay*, but dangerous to go in, except well acquainted, for you muſt go betwixt the Rocks: After you are in, you are ſafe, if without either Cable or Anchor.

About two great Leagues to the Eaſtward of the aforeſaid St. *John*'s *Point*, lieth the Haven of *Donegal*; to ſail in there, you muſt firſt ſhun the Eaſtern Shore, which is very foul, with dry Places and Rocks. When you are come right againſt a little Caſtle that ſtands on the North Side, right againſt which lies off a little Riff from the Shore, that you muſt avoid alſo: And when you are come about the Point of that Riff, you muſt go over again to the North-ſide, for the South-ſide is there flat and ſhoal. Betwixt St. *John*'s *Point* and *Donegal* Haven, along the Coaſt, is all good Anchor Ground.

A Mile on the Southward of the Entrance of this Harbour, is the Haven of *Berry*, only for ſmall Veſſels, and five Miles SSW. from *Berry*, is the Haven of *Bally-ſhannon*; alſo three Leagues Weſt from *Bally Shannon* is the Iſland called *Enniſmurry*, betwixt which two Places are the Roads of *Bundorf* and *Bundat*, where Ships may anchor ſafe. *Enniſmurry* is an Iſland about a Mile and a half in Length, at the South-end of which lies a ſmall Iſland or Rock; come not near the South-end of *Enniſmurry*, for it is very foul, and has a Ledge of Rocks a great way to Sea-ward, but on the SE. Side is good anchoring. From this Iſland to *Bellenden-Point*, is SW. by S. half Southerly; 8 Miles betwixt which Point and *Rala-Point*, are ſome Iſlands and ſunken Rocks, which are dangerous.

From *Rala-Point* SE. by E. 4 Miles, is the Haven of *Sligo*; it is much encumbered with Rocks and Sands in the Entrance, but reaſonably deep; for a Ship of 200 Tuns may come to an Anchor before the Town of *Sligo*.

Directly South of this, is the Haven of *Clonick*, by the *Dutch* called *Endrigo*, which is ſituated in the Bottom of a Bay, and is in its Entrance above a League in Breadth, and five Miles deep. This is a barren Haven, and little frequented.

Six Leagues Weſt from this Bay, is the Haven of *Moyle*, being alſo in the Bottom of a great Bay, and is from the Entrance 2 Leagues; before which is a long Iſland, which makes the Haven, and lies croſs in ſuch a Manner, that there remains but one Channel to go into it. In this broad Bay lie ſome Rocks, which you muſt leave on your Starboard

board ſide, and run towards the little long ſandy Iſland which ſtretcheth itſelf before the Haven, at the Weſt-end of which is a Riff; you muſt go in at the Weſt-end, which Channel is 12 Feet deep. So ſoon as you are in, you will ſee a little round green Iſland, which you muſt leave on your Starboard-ſide; as ſoon as you are right againſt it, you muſt let fall your Anchor, for a little farther is a Shoal, and hard ſandy Ground, the great Ships anchor towards the *Long Iſland*, the leſſer towards the *Green-Iſland*; it falleth here at Low-water always dry: But if you will go from hence to *Moyle* Town, you muſt lighten your Ship to 8 Feet, to come in betwixt the *Long Iſland* and the South Ground; there is at High-water, with an ordinary Tide, no more than 9 Feet. Being come over the Rock you ſhall come into a Pool before the Town of *Moyle*, there you may ride a-float at Low-water againſt the Iſland, it is 15 or 16 Feet Deep.

About 8 Leagues Weſt Northerly, lie the *Stags of Broad-haven*; betwixt which, and the Bay of *Moyle*, the Shore has many Bays and Roads, in which you may anchor. The *Stags of Broad-haven* are ſome Rocks, which ſtretch themſelves out a League from the Eaſt Entrance of *Broad haven*; from which *Broad-haven* lieth in S. by E. 2 Leagues: In the Sound lie four Rocks, which muſt be left on your Starboard-ſide; ſo may you run into the Weſtermoſt Entrance, which is *Broad-haven*.

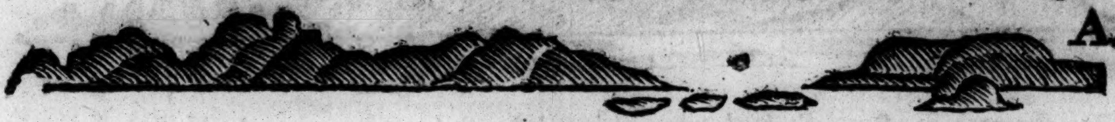
Seven Miles from *Broad-haven*, to the Weſtward, lies an Out-point S W. by W. from the *Stags*; from this out point the *Black-Rock* lies SSW. five Leagues, and about two Leagues SSE. from the *Black Rock* lies *Achill-head*, which is a very high Point upon the Iſles of *Achill*, and ſhews itſelf afar off, like an Iſland with a great Saddle, by which it is well known. Within this Point lie alſo two great and exceeding high Hills, which, together with the Point, you ſhall ſee at Sea, before any other Part of the Land, ſo that the Point doth ſhew itſelf at firſt like three Iſlands. You may ſail between the *Black Rock* and *Achill-head*, and alſo betwixt the ſaid Rock and the Iſland of *Broad-haven*, betwixt which Iſland and *Achill* is a deep Bay: On the North Side of it is a very good Harbour or Haven, 12 Fathom at the Entrance, not inferior to that of *Broad haven*, which indeed is but a continued Harbour; for you go through by a narrow Channel at the bottom into *Broad-haven*. The other Haven, on the South-ſide of the Bay, may alſo be entered without any Difficulty, only beware of a ſunken Rock, which lies off the firſt Point, on your Larboard-ſide; you run in cloſe by it, betwixt that and the Point, but keep not too near the Point, becauſe of the Flat which runs from the Shore; you may, by your Lead, keep in 3 Fathom. When you are paſt this Rock, you may anchor in 5, 4, and 3 Fathom Water: This, as well as the other, is rather a Sound, than an incloſed Harbour; for the Ships that come in here, need not go forth the ſame way again, but ſailing through by the Iſland, may come into the open Sea. Theſe Harbours are nothing famous, being ſeldom reſorted unto by great Ships, except ſuch as by foul Weather and Tempeſt, or other Accidents, are neceſſitated to ſhelter themſelves in the ſame.

From *Achill-head* to the Iſland of *Eniſhtirk*, is 5 Leagues S S E. it lies before a great Bay, and North-weſt from the Iſland called *Enniſboffon*, there is very good Riding, as well as in the Harbour, which you may enter without Danger on the North Channel.

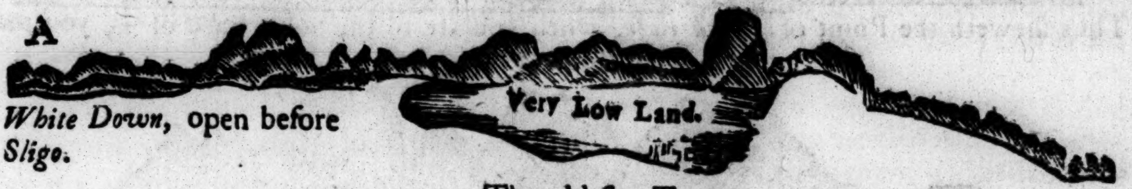
From *Achill-head* to the Point, called *Achariſton*, is 8 Leagues North and South; from the Iſland *Eniſhtirk* to *Slyne head*, are many deep Bays, but being unfrequented, we are not capable at this Time to give a particular Account of them.

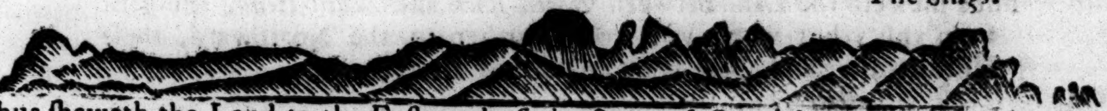
From *Achariſton* Point to *Slyne-head* is S. by E. 8 Miles. This Head is by the Seamen called *Twelve-pence*, becauſe the Land ſhews itſelf in 12 round Hommocks. Betwixt this and *Achill head*, appeareth within the Land, a very high Hill, like a Sugar-loaf, called St. *Patrick's Hill*, or *Corra Patrick*, which may be ſeen a great Diſtance at Sea, and long, as you ſail upon the Coaſt North or South.

In the foreſaid Havens and Roads, an ENE. and WSW. Moon make Full-ſea. In the *Offing*, a SW. and NE. Moon.

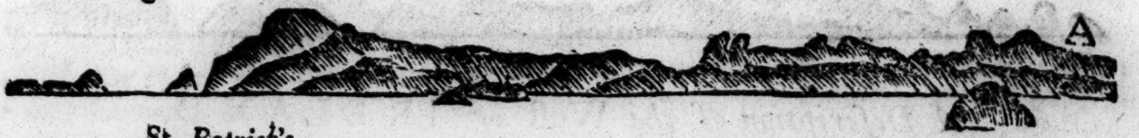

Kilbegh.
The Iſland between *Kilbegh* and the Point *Sligo.*
A.
The high Hommock on the Point of *Sligo.*

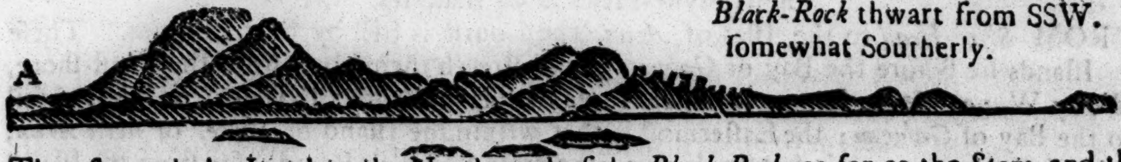
Thus ſheweth the Land betwixt *Kilbegh* and *Sligo*, as is repreſented between theſe two Figures.


A
White Down, open before *Sligo.*
Very Low Land.
The old flat Tower.

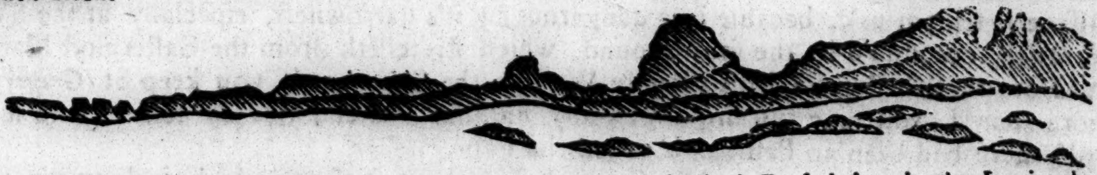


Thus ſheweth the Land to the Eaſtward of the *Stags* of *Broad-haven*, towards *Moyle* and *Sligo.*

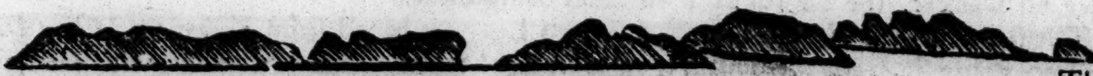

The Entrance of *Broad-haven.*
The *Stags.*
A


St. *Patrick*'s.
Black-Rock thwart from SSW. ſomewhat Southerly.
A

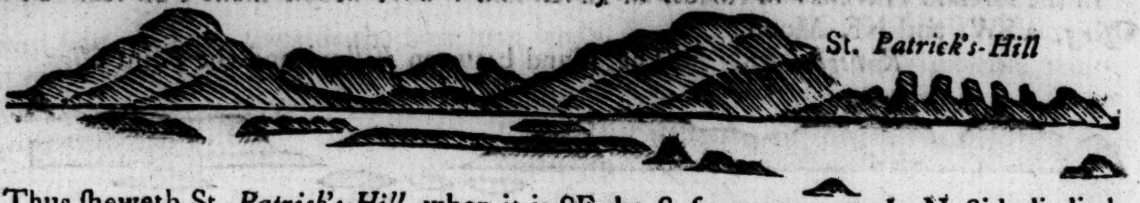
Thus ſheweth the Land to the Northward of the *Black-Rock*, as far as the *Stags*, and then to the Southward, paſt St. *Patrick*'s-*Hill*, as is expreſſed in the foregoing Figures, you being thwart of the *Black-Rock.*


Black-Rock.
St. *Patrick*'s-*Hill.*

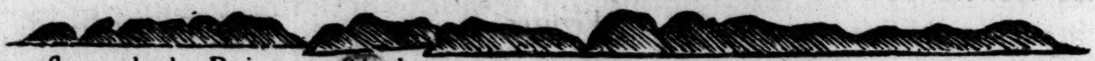
Thus ſheweth the ſecond Point to the Northwards of *Black-Rock*, lying in the Latitude of 54 Degrees 12 Minutes.



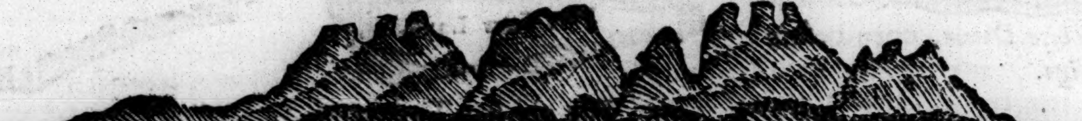
Thus ſheweth the Point of *Black-Rock* when you are to the Northward of it.



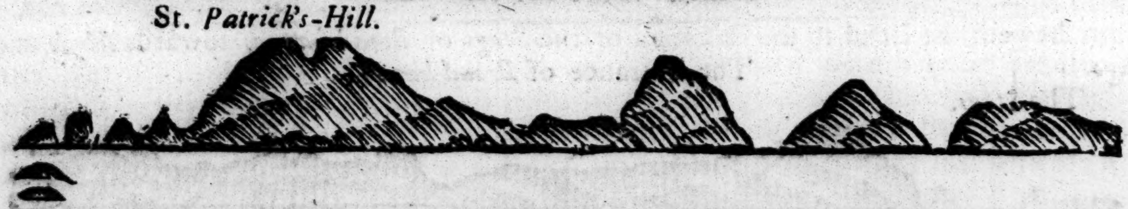
Thus ſheweth St. *Patrick's-Hill*, when it is SE. by S. from you; on the N. Side lie little Iſlands and Rocks not far from the Land.



Thus ſheweth the Point of *Black-Rock*, when you are to the Southward of it, you may ſee a ſharp Rock over the Point.



Thus ſheweth the Land between *Black-Rock* and *Achill-Head*, being E. from you; but when you come farther to the Northward, theſe Hills do alter and come wide one out of another.


St. Patrick's-Hill.

A Deſcription of the Weſt *of* IRELAND.

From Slyne-Head *to the* Blaſques.

FROM *Slyne-Head* to the Iſles of *Aran*, the Courſe is SE. by S. 7 Leagues. Theſe Iſlands lie before the Bay of *Galway*; and ſtretch themſelves from the Weſt-ſhore, NW. by W. near ſeven Leagues. Theſe three Iſlands make four Paſſages, or Inlets to ſail into the Bay of *Galway*; the Eaſtermoſt is that within the Iſland of *Shere*, or little *Aran*, thro' which you may run in boldly, keeping the main Shore on Board; for from the Iſland there lies a great Shoal half Channel over, but to the main 'tis Clear, ſo that you will have no leſs than fifteen Fathom Water; this Channel is called the South Paſſage.

The next Paſſage is between little *Aran*, and St. *Gregory's* or the middle Iſland. This Paſſage is ſeldom us'd, becauſe it is dangerous by it's narrowneſs, eſpecially at the SW. Entrance, occaſion'd by the foul Ground, which ſtretcheth from the Eaſtermoſt Iſland, and from the W. Point a Mile directly W. into the Sea: but if you keep St. *Gregory's* Shore aboard, you may run thro' in twenty Fathom Water; this by ſome (who ſuppos'd there had been no Paſſage) is called the Falſe *Paſſage*.

The third is commonly ſtiled St. *Gregory's* Sound, or Paſſage, which is between the weſtermoſt and middlemoſt Iſland. This is moſt frequented of the three, becauſe you have no Danger, the Shores of both Sides being clear.

The fourth is the N. ſound, which is two Leagues broad from *Killeny* to *Millan Diltar*; in going in from the South, you muſt not keep too near the weſtermoſt Iſland, for its North Shore is very foul rocky Ground, near a Mile off. This Channel lies E. and W. neareſt. From the Entrance of this Channel to *Black-head* (which is the firſt Point of the main Land on your Starboard-ſide going in) is ſeven Leagues; from which Point of *Mutton-Iſland,* which lies at the Entrance of *Galway* Road, is NE. by E. three Leagues and a half. In your Courſe you muſt beware of a Shoal, called the *Black-rocks,* which lie a League to the weſtwards of *Mutton-Iſland,* and about half a League from the Shore; there is five Fathom Water between that and the main, but a very narrow Channel. After you are paſt *Mutton-Iſland,* you may anchor in a Pool, where is five or ſix Fathom in good Ground; you cannot go to *Galway* but with Boats; a SW. Moon makes here a full Sea. It flows ſo ſtrong in this Bay, that the Rocks, which at Low-water are bare, you ſail over them at High-water. The Rivers and Bays in them are all barren and foul; you have a good Road on the South-ſide, between the Iſle of *Dains* and *Eddy,* and to the Eaſt of *Black-head.*

On the North Shore ſailing from *Slyne-head,* you have ſeveral good Harbours, as *Port Naſdoy,* off which lie two ſmall Iſlands, called *Convit Iſles,* another *Conkete.* This Paſſage is a Mile over; you ſail betwixt them, but commonly they leave the Iſlands on the Larboard, and run in where you have fourteen, twelve, eight, and in the Entrance ſeven Fathom. To the Eaſt of this Harbour, NE. by N. above two Miles from *Convit Iſles,* you have the famous Bay of *Batterbuy,* which is above four Miles deep; the Entrance is narrow, but widens ſo much, that about the middle it is two Miles broad, and no leſs than five Fathom Water cloſe to the Shore on both Sides, and ten and twelve Fathom in the middle, all good clear Ground.

From *Port Naſdoy* to *Cronkara-Iſland,* is four Miles SSE. This Iſland is clean; but betwixt that and the Iſle of *Maes,* is foul and not paſſable. If you ſail along the North-ſhore, you muſt keep without the Iſles of *Andue* and *Moſgret,* and ſail in the Mid-Channel, betwixt the *Heltey Roes* Iſland and the latter, ſo may you run in to *Connichin* Bay in fifteen, fourteen, and twelve Fathom Water, and anchor in the Bottom of this Bay, in nine or ſeven Fathom; but come no nearer the North-ſhore than ſix Fathom, for it is foul rocky Ground a Mile and half off.

When you ſail out of this Bay, you have a very fair and open Channel betwixt *Miland Iſland,* and *Heltey Roes Iſland,* about a Mile over from the outer Rocks, which ſtretch themſelves from the Iſlands, and have no leſs than twelve Fathom Water; you may ſail along the North-ſhore, keeping a Mile off, until you come to the *Black rocks,* but nearer you'll find that Shore full of ſunken Rocks, and ſmall Iſlands all along.

If you paſs through the Eaſt Paſſage to the Southward, the Courſe from *Batticla* to *Loup's-head,* is SW. by S. about eleven Leagues, but this courſe will not clear you off the Shoals which ſhoot from *Enniſkerry* Iſlands, which are five Leagues from this Paſſage; therefore you ought to keep a Point and a half more Weſterly to prevent that Danger.

If you paſs through the North Channel, and ſail about the great Iſland of *Aran,* giving a ſmall Offing, then is *Loup's-head* South half Weſterly, fourteen Leagues from you, when you paſs St. *Gregory*'s Channel; *Loup's-head* is SSW. thirteen Leagues from you; It is the North Point of the great and famous River of *Limerick*; this Haven divides the Province of *Connaught* from *Munſter,* being of great Length; for from this Head to *Limerick* is forty five Miles.

From *Loup's-head* to *Kilkerden* Point is near three Leagues Eaſt. This River here is a Mile and a half broad, and 20 Fathom deep. From this Point to *Scatrix* Iſland is 5 Miles Eaſt Northerly, good anchoring all the way, you muſt be cautious of a Bank which comes from the South-ſhore, which is called *Bell-Caſtle-Bank*, for it comes to that Point, and is about a Mile and a half from this Point of *Kilkerden*.

Scatrix Iſland is all clear; on the NW. Point comes a ſmall Shoal, cloſe by which you have 2 Fathom and a half Water. On the North Side of this Iſland the Channel is ſeven Fathom cloſe by the Iſland, and twelve in the middle; ENE. of this Iſland lies a ſmall Iſland about half a Mile off, called *Hog*; by theſe two Iſlands is a clear Paſſage of two Fathom, and another Paſſage between the *Hog* and the Shore of five Fathom, you have good Anchoring any where about theſe Iſlands.

From *Scatrix* Iſland to *Starboard-Point*, or Iſland, E. by S. half ſoutherly, 11 Miles, is a fair Paſſage on both Sides the River, and good Anchorage in any Place, and deep Water from 30 to 12, and cloſe to the Point 10 Fathom, and in the Middle of the Channel 15 Fathom. This Iſland is on the South-ſhore, and from the Point reaches to two Thirds of the Channel.

From *Starboard Point* is two Leagues and a half North to *Tovin* Iſle; upon this Courſe you muſt ſail ſoutherly to clear the North-ſhore, which about two Miles points out to the South; keeping the Middle of the Channel, you have nothing dangerous, for 'tis all deep Water, and good Anchoring.

From *Tovin* Iſland, you come to a great Rock, called the *Beef*, or *Raven*, and two ſmall Rocks, called the *Little Beefs*. Theſe Rocks lie triangular-wiſe, and are from this Iſland E. by N. 3 Miles; they are foul, therefore you muſt keep to the Southward of them where you have 9 Fathom Water. On the North of theſe Rocks is a deep Bay, full of ſmall Iſlands and Rocks, and ſeveral ſhallow Channels going into *Clare* River.

From the *Beefs* you muſt keep the Middle of the Channel; for about three Miles and a half farther you will have ſome ſunken Rocks, which lie upon the End of a middle Ground, called *Hearts Rocks*; you muſt keep to the Southward of them, where you will have two Fathom and three Fathom and a half Water. Four Miles farther you come to the Opening of the River *Bond Ratty*, where you will ſee two ſmall Iſlands, the one upon the Eaſt Point of the River, the other a little above it; the firſt is called *Key Iſles*, the other *Graſs Iſles*; you muſt keep the Iſland aboard, and leave another on the Starboard-ſide, which lies off theſe two Iſlands on the other Shore: But a Mile before you come up with theſe Iſlands, you will meet with a Shoal of Rocks, called *Dough*; the Rocks are right off *Boany Point*, on the North-ſide of the River. You may know this Point by an Iſland which lies to the Weſt a-breaſt with the Point. This Iſland is called the *Sainee*; you muſt keep the Rock on your Larboard, and ſail to the South of them.

Half a Mile from the Iſland *Graſs*, you will ſee two ſmall Iſlands more, betwixt which you may paſs in the Middle of the Channel, where you will have two Fathom Water. About a Mile farther, lie ſome Rocks on the North-ſhore; if you keep the Middle of the River ſomewhat to the Southward, you may paſs them without Danger; there is (keeping the Middle of the River) no more Danger, but you may ſail up to *Limerick*. When you come before the Town, in the Haven, you muſt make faſt on the Caſtle with three or four Cables, for there goes a very ſtrong Tide, as well Flood as Ebb.

Betwixt *Loup's-head* and thoſe Iſlands called the *Blaſques*, which is the moſt Weſtward of all the Land of *Ireland*, it is SW. by W. twelve Leagues; from *Loup's-head* to Point *Kerre*, or Cape *Sanon*, is ſeven Miles. S. by W. to the South of this Point, runs in a round and deep Bay, called *Tralee* Bay, in the Middle of which is an Iſland, called *Fenor*; this Bay is three Leagues deep, and about two Leagues at the Entrance; and next to that is another Bay, called *Likerm* Bay, or by ſome, *Hog* Bay, by reaſon of many ſmall Iſlands there, called by that Name. Eight Miles further Weſt, is the Bay or Haven of

Smirx

Smirwick; from this Haven to the Mouth of the River *Shannon*, the Courſe is ENE. 7 Leagues, the Shore being clear and free from any Danger.

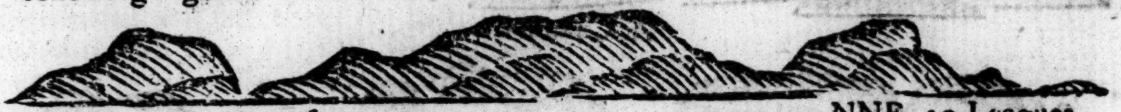
In *Smirwick* Haven is good and ſafe Anchoring from any Wind, but that from the North, to which it lies expoſed. You have no Danger coming into this Harbour, there is a ſmall Rock or Iſland at the Eaſt Point coming in, but is always above Water, and clean Ground by it; coming about the Weſtermoſt Point, you have three Iſlands lying along the Shore, called *Three Siſters*; theſe lie at the Entrance of the Sound or Paſſage, called *Blaſques Sound*, which receives its Name from thoſe Iſlands that lie off this Promontory.

Of the Tides, &c.

At *Galway*, a NE. and SW. Moon make a full Sea.

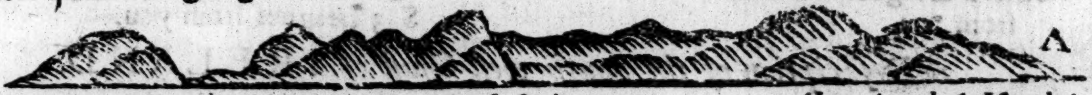
At *Limerick*, an ENE. and WSW. Moon make High-water.

The Iſlands, as alſo the main Land, to the Northwards and Southwards of the Bay of *Galway*, when you are right before the Iſland *Aran*, ſhew as are expreſſed in theſe 5 following Figures.

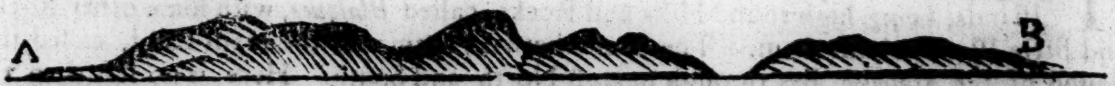


North being 8 Leagues from you. NNE. 10 Leagues.

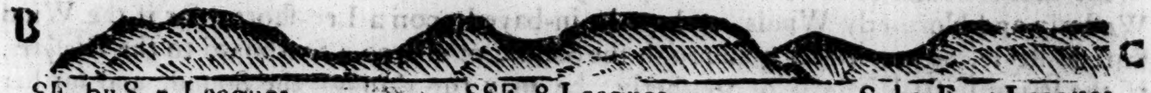
Theſe 4 following Figures belong to each other, as it is expreſſed by the Marks.



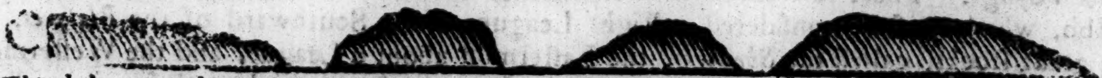
NNW. the main Land to the Northward of *Galway* *(betwixt theſe Iſlands is 20 Fathom Water.)* N. 3 Leagues.



The three Iſlands of *Aran*, before *Galway*, E. and E by N. four Leagues E by S. and ESE.

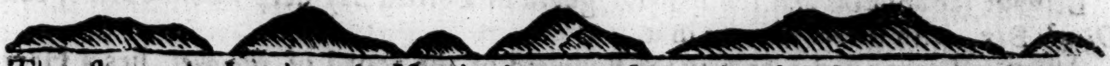


SE. by S. 7 Leagues. SSE. 8 Leagues. S. by E. 9 Leagues.



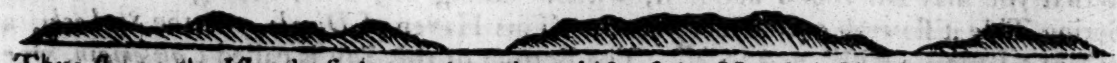
This belongs to three foregoing Figures, AA, AB, BC, *and ſhould join one to another.*

NNE. 4 Leagues. E. 5 Leagues. NE by E. 5 Leagues.

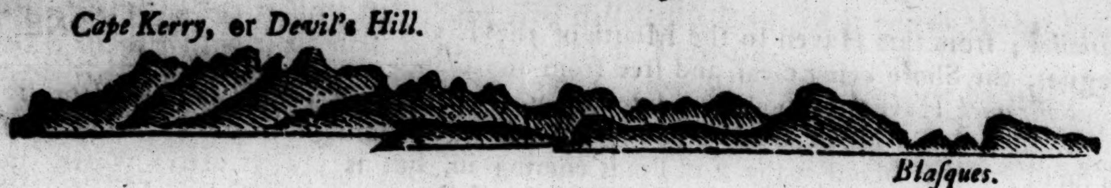


Thus ſhews the Land on the Iſlands, between *Limerick* and *Galway*, when you ſail towards them.

NE by N. 4 Leagues. NE. 4 Leagues. NE by E. 5 Leagues.



Thus ſhews the Iſland of *Aran*, when the midſt of the Iſlands is N. about 5 Leagues diſtant, then the Southermoſt Iſlands ſhew flat.


Cape Kerry, or Devil's Hill.
Blaſques.

Thus ſhews *Cape Kerry*, or *Devil's Hill*, lying NE. by E. towards the *Blaſques* 5 or 6 Leagues, as is deſcribed in theſe Figures, when the aforeſaid Hills are ESE. 3 or 4 Leagues from you. Iſlands to the Northwards of the *Blaſques Sound* of *Blaſques.*

SSE. 2 Leagues and a half from you.

Thus ſhews the *Blaſques*, being SE. by S. 3 Leagues from you.

A Deſcription of the South-weſt Coaſt of IRELAND.

From the River Shannon *to* Dungarvon.

THree or four Leagues WSW. from *Smirwick*, a little off from the Land, lie four Iſlands, being high round Hills and Rocks, called *Blaſques*, with ſome other Rocks and little Iſlands about them. The Sound betwixt them and the main Land, called the Sound of the *Blaſques*, lies through neareſt North and South. Here is no leſs than 10 Fathom through the Sound.

He that is bound to the Northward, may Anchor at the S. Side before the Sound, for Weſterly and Northerly Winds, and not be in-bayed upon a Lee-ſhore; for if the Wind ſhifts Eaſterly, he may either go through the Sound, or elſe go a Starboard to the *Blaſques*. If the Wind ſhifts Weſterly or Southerly, he may run through the Sound, and further his Voyage. There runs through a very ſtrong Tide, as well of the Flood, as of the Ebb, which muſt be conſidered. Eight Leagues to the Southward of the *Blaſques*, lie 3 great Rocks, called the *Shellocks*, the Eaſtermoſt about a League, and the Weſtermoſt 3 Leagues from the Land; when you come from the Southward, and ſee them firſt, they ſhew like Sails of Ships.

Betwixt the *Shellocks* and the *Blaſques*, goeth in a broad Bay deep into the Land, called *Dingle* Bay, with divers Havens in it.

About a League and a half to the Eaſtward of the Sound of *Blaſques*, lies a Haven, called *Ventrie*, a great League to the Eaſtward of it; another called *Dingle*, or *Dingle de Couch*, it lies NW. in; at the W. Point of it lies a Rock, called the *Cow*, which is clean, ſo that you may ſail round about it, without taking any hurt, at High-water; with a Spring Tide it floweth even under Water. This Haven of *Dingle*, and the *Shellocks*, are diſtant 9 Leagues NNE. and SSW. The Bottom of this Bay is called *Caſtlemain*, where Ships may lie very ſafe.

NE. from the *Shellocks*, S by E. from the Sound of the *Blaſques*, and S. from the *Ventrie*, lies a Haven, at the E. End of the Iſland *Valentia*, called *Begin*'s Bay, which lies ESE.

in; you muſt give the E. Point of the Iſland a Birth off, becauſe it is foul, and lies a good way off. There lies alſo a ſunken Rock on this Iſland's ſide, which you muſt take heed of: When you are come within the Entry of the Haven, you muſt go E by N. unto the Road, which is right againſt a red Cliff that lieth on the S. ſide.

As you ſail within the *Shellocks*, you paſs *Bolus* Bay; about the S. Point of which is a very good Harbour, called *Lough-green* Bay, in which is very ſafe riding for many Ships, except with the Wind from the S. to SW.

The *Shellocks*, and Cape *Dorſey*, lie NW. and SE. ſix Leagues aſunder, betwixt them goes in alſo a great broad Sound NE. called *Killmore* Sound or River, at the Entrance of which you have 4 Iſlands, which range SW. by W. on the North Side of this Sound; in which are many good Havens and Roads, where you ride ſafe and land-lock'd. When you enter this Sound, you leave the Iſland *Wenis* land-lock'd on your Larboard, then you have 45 Fathom Water, which Depth continues until you come off *Cods-Head*, which is the ſecond Point on the Starboard, or the Eaſt Point of *Kilmore* Bay. Two Leagues farther is a fine deep Bay, called *Killaruſh*, in which you may ride all Winds ſafe, in 8, 7, or 6 Fathom; and juſt about the Eaſtermoſt Point of *Killaruſh*, is the Bay of *Kilmelog*, not inferior to this; and NNW. from *Killaruſh*, over on the North Shore, is the Road or Bay of *Donkerney*. The South Point of *Kilmore* Sound is called *Claneriſh*; betwixt which Point and the *Dorſey*, is a deep Bay.

Cape *Dorſey* is an Iſland, within which a Ship may ſail and ride under. To go in there from the Southward, you muſt give the Eaſt Side a Birth, that is, the Side of the main Land which is foul, and run in along by the ſide of the Iſland, until you are come within, where you may Anchor ſafe.

Without Cape *Dorſey* lie ſeveral great Rocks, which are clean round about, ſo that you may ſail through between them without fear, there is nothing that can hurt you but what may be ſeen.

About 6 Leagues SE. from Cape *Dorſey*, lies the Point *Mizen-head*, betwixt them both goes in a great Bay or River, deep into the Land, called *Bantry*, in which are divers Havens and Roads.

A great League to the Northward of *Mizen-head*, lies a Point called the *Three Caſtle-head*; upon it ſtand three Towers, but you can hardly ſee them, except you be near the Land: Alſo five Miles N by E. from the *Three Caſtle-head*, lies a ſmall Point called *Sheep's-head*. Betwixt theſe two Points goes in a great broad Bay, called *Donnam*'s Bay; it is a Place of no Trade, and little frequented. It is a fit Place to ſave Ships, and all over good Anchor Ground.

From *Sheep's-head* to *Beer-haven*, the Courſe is NW. by W. about a League; it goes in between an Iſland on the Eaſt Side and the main Land, towards Cape *Dorſey* on the Weſt Side; it is about a great Muſket Shot broad; the foreſaid Iſland on the Eaſt Side, is called the Iſland of *Beer-haven*, and is about two Leagues long. To ſail in there, you muſt keep the mid-way in the Entry of the Haven, which is clean, without any foul Ground. After you are come in, there ſtandeth on the Larboard-ſide a ruin'd Caſtle, and a little farther are two little Rivers, cloſe one by another; between theſe two little Rivers ſtand ſome Fiſhermens Houſes; you may ſail into the foreſaid Rivers, they are deep enough, but the common Place of Anchoring is before them, or by that foreſaid ruined Caſtle, or elſe ſomewhat farther in; it is all over good Anchoring, and clean Ground, except right againſt the foreſaid Rivers lie ſome Rocks about the middle of the Channel, which are covered at High-water; theſe only muſt be ſhunned, but you may go on either Side of them.

Somewhat further in the Bay ſtands another Caſtle, called *Old caſtle*, from thence a Ship may ſail along to the Northward of the Iſland of *Beer-haven*, and come out to the Eaſtward into *Bantry*, which lies at the Bottom of the Bay, and from thence it is called *Bantry* Bay.

The Sound on the North Side of the Iſland is large, broad and clean, 13, 12 and 10 Fathom deep.

The Eaſt Point of the Iſland is a ſharp Point, and very foul; there lies off a Ledge of Rocks, ſome of which lie under Water at Low-water; but the Side of the Main is clean and clear. In this Entry lie alſo two great Rocks high above Water, but clean round about, you may run through between theſe Rocks, or to the Southward, betwixt them and the aforeſaid Ledge of Rocks, or alſo to the Northwards, betwixt them and the main Land, as well in coming in, as ſailing out, there is no Danger more than may be ſeen.

From *Beer-haven*, to the NE. Point of the Iſland *Whiddy*, over againſt which lies *Bantry*, is ENE. four Leagues. The Entrance of this great Bay of *Bantry*, is very clear from any Danger but what is viſible; it is deep Water. Over againſt *Beer-haven*, in the midſt of the fair Way, is forty, thirty-ſix, and thirty Fathom within, and betwixt the ſaid Iſland and the Main, which is called the *North-Sound*, or *Beer-haven*, is ten and fifteen Fathom deep; and further in towards the Iſland *Whiddy*, it is again twenty and twenty-five Fathom deep. You may ſail round about the Iſland *Whiddy*, (which is about a League) but it is beſt to ſail in to the Northward, or to the Eaſtward, where you may go in cloſe by the N. or E. Point; but a little within the Point, lies a little Ledge of Rocks, a little Muſket Shot off from the Shore, which at High-water lies covered, but at half Ebb begins to come above Water, that only is there to be ſhunned; being paſt it, you may Anchor all over; but being about that Point, there lie two ſmall Iſlands, by the greater you my ſail on both Sides of it, either within or without it, until you come before a Gentleman's Houſe by the Iſland *Whiddy*, which is white, and Anchor there right againſt it, in three, four, or five Fathom, as deep or ſhallow, according as you deſire to ride near or far from the Shore; it is there all over clean Ground. But to ſail to the Southward of *Whiddy*, you had need be very well acquainted; for betwixt this Iſland and the main Land, 'tis in moſt Places foul and ſtony; alſo from the Weſt End of the *Whiddy*, lie ſome foul Grounds and Rocks, ſomewhat off the Iſland to Seawards, ſome above, and ſome under Water.

To the Southward of *Whiddy*, upon the main Land, ſtands a Friery or Abbey; right againſt it is the common Road, and it is very good Ground, in 4, 5, or 6 Fathom, according as you ſhall ride far or near to the Shore; to the Northward lies a little Iſland, ſo low in the midſt, that at Spring Tides the Sea flows over, and divides it in two.

A great League from the Eaſt Point of the *Whiddy*, WNW. lies a Haven, called *Longerf*; when you ſail from the aforeſaid Point towards it, you ſhall meet right in the Fair-way, about half way over, a great Rock, which you may ſail about on both ſides, but it is beſt on the off-ſide, becauſe it is clean and clear, but on the inner-ſide lies ſome foul Ground. He that will ſail through on the inner-ſide, had need to be very well acquainted. This Haven of *Longerf* lies NNW. In the Entrance on the Starboard-ſide, lies ſome foul Ground, which at Low-water (at the Spring Tides) may be ſeen dry; theſe muſt be ſhunned, or elſe it is there within all over good Anchoring, and good Ground; there is no Danger but what may be ſeen.

When you are near the Iſland *Whiddy*, about the midſt of the Bay, you cannot ſee the Land without the Iſland *Beer-haven*, on the Weſt Side of the Bay, becauſe it ſalls away to the Weſtwards.

From *Mizen-head*, unto *Cape Clear*, the Courſe is E. by S. half Southerly, four or five Leagues. About two Leagues within, or to the Eaſt of *Mizen-head*, and NW. from *Cape Clear*, lies a Haven called *Crook-haven*. He that comes from the Eaſt, and is bound in there, muſt run in along by *Cape Clear*, up about it to the Northwards, ſo far, until he may ſee through into the Sea, to the Northwards of *Cape Clear*, as through a Hole, and ſet then his Courſe WNW. keeping that aforeſaid Hole (to the Northwards of *Cape Clear)* open, then he ſhall ſail right with *Crook-haven*, which lies in WSW. and there he may anchor before the little Town, in three Fathom and two Fathom and a half. It was wont heretofore to be deeper there; but it is ſpoiled moſt by caſting of Ballaſt; you may alſo anchor further out than before the Town; there it is deeper, and all over clear Ground.

Two little Leagues, W. by S. from *Cape Clear*, lies a high ſteep Rock alone in the Sea, called *Faſtney*, which ſhews at firſt Sight like unto a Sail. Three or four Leagues North from this Rock, lies a Haven called *School-haven*.

N. by E. from *Cape Clear*, between it and the main, lies another Iſland called Iſle *Sherk*, or *Iniſherkin*. To the eaſtward of which goes in a Haven, called *Baltimore-haven*; it is ſomewhat narrow at the Mouth of the Haven, but within it is large and broad; there you may anchor on both Sides where you will, and lie landlock'd for all Winds. On the Weſt-ſide, within the Haven, ſtands a *Friery*, cloſe before it you may anchor in five or ſix Fathom, in the midſt of the Haven, it is ſix and ſeven Fathom deep. A little to the Northwards of the foreſaid *Friery*, ſtands a Caſtle upon the Point. In the Mouth of the Haven lies a ſunken Rock, neareſt to the Eaſt-ſide, and within the midſt of the Haven is a Rock, which at High-water lies under, and at Low-water lies above Water; there is nothing elſe that can hurt. A little to the Eaſtwards, without the Haven, lies another Rock, ſix or ſeven Ships Length from the Shore.

To ſail through within the Iſlands of Cape Clear.

To the North-ward of the Iſle of *Iniſherkin*, you may go the Weſt-wards through betwixt Iſle *Iniſherkin*, and the Iſland *Spain*, and come out again into the ſtea by *Cape Clear*; but it is to be done only with ſmall Ships, and not without Danger. Betwixt Iſle *Iniſherkin* and *Spain*, there is at half Flood not more than twelve or thirteen Feet Water. Alſo at divers other Places betwixt theſe Iſlands, it is rocky and Shoal, ſo that it is not good to go through within, except you be very well acquainted, and then at High-water and Spring-tides.

Going into *Baltimore* in the narrow of the Harbour's Mouth, on the Eaſt-ſide from the Point lies a Ledge of Rocks about half a Cable's Length from the Shore, which at Low-water is dry; when you are paſt that, and within the Harbour's Mouth, you may come to an Anchor by the Port in five Fathom, for in the middle of the Harbour are many ſunken Rocks, which are dry at Low-water. On the Weſt-ſide is a very ſtony Battery, and on the Eaſt ſide (which is a very bluff Point) ſtands a Watch-houſe: As you go in, it is beſt to keep the Weſt-ſhore on board to avoid this Danger as above, where you will have no leſs than five Fathom at the Harbour's Mouth; you may anchor on the Weſt-ſide againſt the Caſtle, and on the Eaſt-ſide againſt the Old Abbey, about a Mile and a half, or two Miles up.

He that comes into this Harbour, to get good Ground in a Ship of twelve or fourteen Feet Water, ſo ſoon as he is in the Mouth of the Harbour, muſt run away Eaſt near the Point, and anchor before the Town of *Baltimore*, there he may lie landlock'd; but a Man of War, or a Ship of a great Burthen, muſt run in no further than to bring that *Friery*, or old Abbey on the Weſt-ſide to bear Weſt, where you will have five Fathom, but there is not above two Fathom often, when you come above the Governor's Houſe, nor to the Eaſtwards above the Town of *Baltimore*; and from the Rock in the Middle of the Harbour, that ſhews itſelf at Low-water. There are to the Weſtward of it, three Ledges more, one within half a Cable's Length of another.

A little League to the Eaſtward of *Baltimore*, lie the *Stags*, a Mile from the Shore; they are five or ſix high ſteep Rocks. When you come from the Eaſtward along by the Shore, and get firſt Sight of them, they are like unto ſome ſpiry Towers together; you may ſail through betwixt them and the main Land, it is there large and broad enough.

North-eaſt, about two Leagues from the ſaid *Stags*, lies *Caſtle-haven*; without it on the Weſt-ſide, lies a little flat Iſland, called the *Horſe*; you muſt leave it on the Larboard, and another little flat Iſland on the Starboardſide, that lies ſo cloſe to the Land, that at Low-water you may go dry-foot over from it to the main Land. Within the Haven ſtands a little Chappel; when you will ſail in there, you muſt run in right with it, cloſe along by the foreſaid little Iſland on the Eaſt-ſide, and when you are thwart of the Chappel, you ſhall ſee a Caſtle on the Weſt-ſide; over againſt that Caſtle you may anchor in twelve Fathom.

Two Leagues NE. from this Haven, is that of *Roſe*.

From *Caſtle-haven* unto *Old-head*, the Courſe lies ENE. and WSW. nine Leagues, but *Cape Clear* and the *Old Head* lie NE. by E. and ENE. Diſtance 13 Leagues.

About half way betwixt *Caſtle-haven* and the *Old-Head*, lies a high Point, called by the *Iriſh*, *Kedenetedo*; there, by it on the Weſt-ſide, is a good Haven, called *Clandore*. For to ſail in there, you muſt run in cloſe a-board by that foreſaid high Land on the Eaſt-ſide, ſo as to ſhun a Range of Rocks that lie on the Weſt-ſide, and lies off ſomewhat towards the Eaſt-ſide; when you come in, you may anchor before a Caſtle, in five or ſeven Fathom.

The *Old Head*, or *Cape de Velbo*, is a Point that lies out far without the other Land; the outermoſt South-end of it is very high and ſteep, when you come along the Shore from the Eaſt or from the Weſt, and ſee it firſt, it ſeems to be an Iſland: Upon the Top of it ſtands a Light-houſe, which ſerveth only for a Mark. On both Sides of this outlying Point, you may anchor as deep, or as ſhoal as you pleaſe.

North about a League from *Old-Head*, is *Kinſale* Harbour; near the Shore, you have 16 and 17 Fathom, but half a Mile off 25, your Courſe is direct North. The two Points at the Entrance of this Harbour, lie Eaſt and Weſt of each other, and not above half a Mile aſunder; that on the Eaſt, is called *Prebain* Point, from which Point, a little to the SE. lie three ſmall Rocks, called the *Bull-man*; they are very foul, but betwixt them and the Main (which is very clean) is a good and ſafe Paſſage of four Fathom.

The other Point is called *Sandy-Cove* Point, which has its Name from a Sandy Cove juſt to the Weſtward of it; this Point is foul.

Betwixt theſe two Points, you muſt run in NNE half a Mile, and then Northerly about half ſo far, until you come to the Bar: In this Way, you have from ten to three and four and a half Fathom at the Bar. This Bar croſſes the Harbour juſt above the ſecond Point, called *Money* Point; from whence runs a Ledge of foul Ground.

When you go over this Bar, keep the Eaſt Shore on board, for that's the deepeſt Water. Your Courſe now is NNW. you have here 3 Fathom and a half at Low-water; continue your way along the Eaſt Shore if you would have the deepeſt Water; although you have no leſs than four Fathom in the middle, after you have paſſed the Bar to ſix or ſeven. When you come the Length of *Old-fort* Point, which is the next on your Larboard-ſide going up, beware you come not too near, for there runs a Spit of Sand North, half Channel over, upon which you have but ſeven Feet at Low-water; but in the middle of the Channel you may go round in ſix, and on the North-ſide eight Fathom; when you come up to the Town you may Anchor near the Quay in three Fathom, and at the South End of the Town in five. The Channel is ſo plainly deſcribed in the Draught of *Kinſale* Harbour, ſold by *Jane Grierſon*, *Dublin*, that it is better than all Directions that can be given about it.

Money Point, and the Point of the *Old-fort*, make a deep Bay, in which Bay is a great flat Sand which dries at Low-water. Half a Mile SE. by E. from *Prebain* Point is *Hungman* Point; and about a Mile farther NE. is the Haven called *Oyſter-haven*: This is a ſmall and narrow Haven, all clean and free from Rocks in your going in; but after you have run a Cable's Length or a little more within the Points, beware of a ſmall Sand which lies on the Starboard-ſhore; you may run to the Weſtward of it in 3 Fathom Water. About a Quarter of a Mile South from the Eaſtermoſt Point, lies a ſmall Iſland, called *Oyſter-haven* Iſland: SSW. from this Iſland are two more, called *Oyſter-haven Stags*. You may paſs round theſe Iſlands without Danger.

Three Leagues and a half NE. by E. from *Kinſale*, is the Harbour of *Cork*; the Shore is good and bold, ſo that there is no Danger but what appears. About a League to the Weſtward you will ſee as you ſail along, two ſteep Hommocks like Towers in the Land, not far from each other; theſe are notable Marks to know the Coaſt by, and when you, are thwart to the Eaſtermoſt, you may ſee the Haven's Mouth of *Cork*. The Harbour of *Cork* has a very ſafe and fair going in, at the Entrance is two Miles over; upon the Eaſtermoſt Point are two ſmall Iſlands, or dry Rocks, called the *Stags*, but no Danger in going near them: You have no leſs than ten Fathom at your Entrance, then five, after three, then three and a half; the ſhoaleſt Water is upon a Bank, called *Turbet*'s Bank, cloſe to which you have two or three Fathom, and above it four and ſix, and between the two Points eight Fathom. The Bay on your Starboard-ſide is called *White*'s Bay; the Point to the Northward of this Bay, called *Dog's-Noſe*, upon which ſtands a Tower, and the Point on the Weſt Shore is called *Ram's-head*: Betwixt the two Heads or Points, you enter a great broad Lake, you muſt ſteer N. by E. half Eaſterly, keeping an Iſland which you will ſee before you, called *Spike*'s Iſland, on your Larboard-ſide, ſteer directly with a Bay called *Kuſkine*, which you will ſee upon the Land before you; you will have there ſeven, ſix and five Fathom. When you come within a Cable's Length of the Shore before you, then ſteer away Weſt, keeping the North Shore on board, you will ſee before you an Iſland, called *Hale-bowling* Iſland, run betwixt that and the Shore on your Starboard-ſide, where you will have ſeven or 8 Fathom, and being about the Point which is called *Battery* Point, ſteer North up this Reach without any fear, you will find no leſs than five Fathom, and the Shoals clear; at the upper End of this Reach, on your Larboard or Weſt-ſide, is a Village called *Paſſage*, where great Ships come to an Anchor.

The upper Point on the Eaſt, is called *Roman*'s Point; you muſt keep this Point on board, becauſe of a Muſcle Bank which runs off from the Shore, therefore when you paſs this Point, keep your Courſe until you are half-way over to the North Shore, or that you begin to open the Land to the Weſtward of *Horſe-head* Point, and then direct your Courſe Weſt until you are the Length of *Horſe-head*, which is the outer or North Point on the Weſt Side of the Reach you come at laſt through; when you have ſhot the Length of this Head, ſteer NW. and NW. by N. to *Barry*'s Point, and from thence keeping the Starboard Shore on Board, for the other Shore is flat off, keep by your Lead in two or three Fathom Water; keep this Courſe until you have the City of *Cork* open with the River, then you may ſteer in with the *Black-Rock* Point, and come to Anchor within it.

To the Weſtward of *Ram-head* Point in *Croſs-haven*, where any Ship may go in to ſtop a Tide, if occaſion requires, you are here Land-locked and ſafe from all Winds. From the *Stags* (which lie upon the Eaſt Point going into this Harbour) four Miles Eaſt is a ſmall Iſland or Rock, called the *Hawk's-Rock*. A League to the Eaſtward of the Haven's Mouth, ſtands a Tower upon a high Point cloſe to the Water ſide, with ten or twelve thatched Houſes by it; moreover, a League farther Eaſt, by a ſmooth Point, lies a long Rock grown about with Ore, upon the Eaſt-ſide of that Point ſtands a flat Tower; it is to the Eaſtwards all Low-land unto the Point of *Youghall*.

Four Leagues to the Eaſtward of *Cork-haven*, lies *Ballecotton* Iſland, within which you may ride for Weſterly and Southerly Winds, in 4, 5, or 6 Fathom: *Cork* and *Youghall* lie NE. by E. and SW. by W. diſtant 6 Leagues.

Youghall is a broad Haven, you muſt always obſerve to go in at High-water by the Eaſt Shore, it lies North and South in; the Weſt-ſide is a ſandy Strand all along to the Town. About a League South by Eaſt from the Haven's Mouth of *Youghall*, lies a little Iſland, called *Chappel*, under it on the Eaſt-ſide is a good Road; if you come before *Youghall* at Low-water, you may go under the foreſaid Iſland to ride there, and ſtay for the laſt Quarter Flood, and there is four Fathom Water upon the Bank. At the Weſt Point of the Haven's Mouth lies a Rock within it, and about half way to the Town ſtands a Friery, before which you may ride: You may alſo edge over to the Eaſt Shore, and then run up the River; within it is three, four, and five Fathom. From the Eaſt-ſide lies a Range of Rocks, at leaſt half ways over in the Haven's Mouth, and a little without the Rocks there is but five or ſix Feet Water.

Five Leagues NE. from *Youghall*, lies *Dungarvon* Haven, betwixt both lies an out Point, a little to the Eaſtwards of it ſtands a high black Tower, called *Ardimore-head*, which may be ſeen near 4 Leagues at Sea; within it is a Bay, which is a good Road for weſterly Winds, in 7 or 8 Fathom. *Dungarvon* is a narrow Tide-haven, the Mouth is full of Rocks, and at Low-water falls dry; you muſt go in there at High-water, and run in through betwixt the Rocks: It lies in Weſt, within it is deep enough.

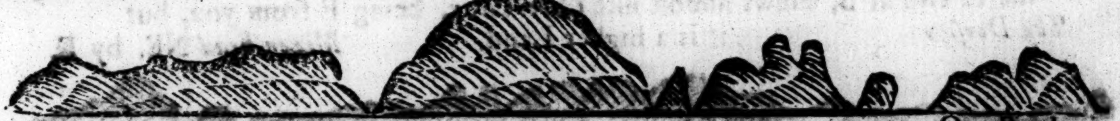
The Town of *Dungarvon* lies upon the North-ſide of the Haven.

Up in the Country NNW. from *Dungarvon*, at the Mountain of *Sleges*, which ſome call the high Mountains of *Dungarvon*, or *Capo de Quin*, or *Caray Quin*, or *Kilgeknet*; it ſhews it ſelf with three exceeding high Hommocks, far above any other Land thereabouts. You may ſee it at Sea a great Part of the South Coaſt of *Ireland*, when the Mountain bears NNW. from you, and if you ſail in right with it, you ſhall fall in right with *Dungarvon*. When you have it North from you, and ſail in right with it, then you ſhall fall with *Youghall*, being NNE. then you ſhall fall in with *Cork*, but when it ſhall be NW. and ſo run in, you ſhall fall with *Waterford*.

In all the foreſaid Havens an ENE. and WSW. Moon make High-water, or a Point later, as lie deep within the Land, but a Sea-board the Coaſt, in the Offing, a NE. and SW. Moon. At the *Mizen-head*, *Cape-Clare*, and the Coaſt to the Eaſtwards, a WSW. and ENE. Moon make High-water; within the Haven and Indraughts, a Point later, *to wit*, E. by N. and W. by S. but in the Channel, a Sea-board the Land, a NE. and SW. Without *Cape-Clare*, by the Land, the Flood falls away E. and the Ebb W. but to the Eaſtwards of *Cape-Clare*, ENE. and WSW.

On the South Coaſt of *Ireland*, an ENE. and WSW. Moon make High-water; within the Havens, a Point later, *to wit*, an E. by N. and W. by S. but in the Offing, a Sea-board, a SW. and NE. Moon. Betwixt *Cape-Clare*, along the Coaſt before *Waterford*, into the Point of *Carnaroot*, the Flood falls along the Coaſt ENE. and the Ebb WSW.

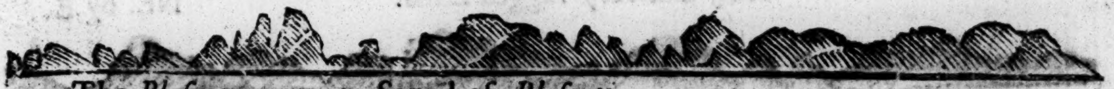
Betwixt *Cape Clare* and the *Dorſeys*, you may ſee the Land in fifty-eight and ſixty Fathom, from *Cape Clare* to the Eaſtward unto *Waterford*, you may ſee the Land in fifty-four Fathom. The moſt Part of the South Coaſt of *Ireland*, you may ſee in thirty-five and forty Fathom; in thirty-five Fathom you will not be far from the Land, therefore come no nearer *Ireland* by Night than in forty Fathom. At *Blaſques* Sound, and *Baltimore* Haven, it flows ENE. and WSW.



Out Rocks.

Thus ſhew the high Rocks of the *Blaſques*, Being 2 Leagues E. by S. from you.

SSE. 3 Leagues from you.



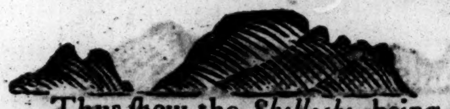
The *Blaſques*. Sound of *Blaſques*.

Thus ſhew the *Blaſques* and the Land to the Eaſtward of them, when you ſail towards them from the *Shellocks*.

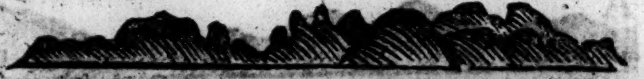
An Entrance. All double ragged Land.

Thus ſhew the *Shellocks*, with the Land to the Eaſt or Northwards of them as you ſail by, being ſomewhat to the Northwards of them.

Thus ſhew the Iſlands lying to the Northward and Eaſtward of the *Shellock* being by them.



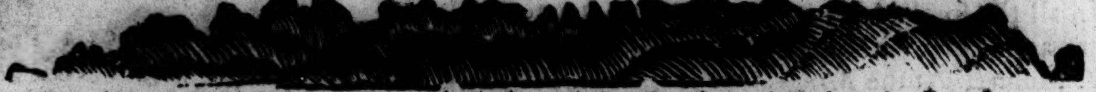
Thus ſhew the *Shellocks*, being E. by S. or ESE. 2 Leagues and a half from you.



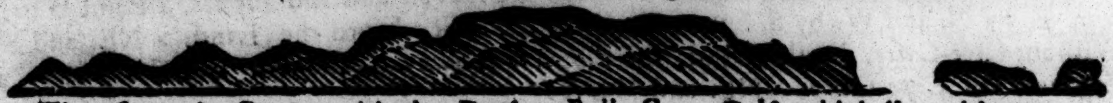
This is an Entrance.

Theſe Iſlands lie to the Southward and Eaſtward of the *Shellocks*, the Land from thence Eaſtward towards the *Dorſeys*, is all high, broken, and very ragged Land.

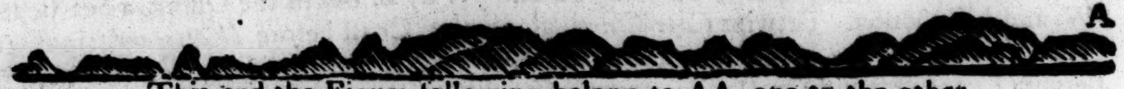
This



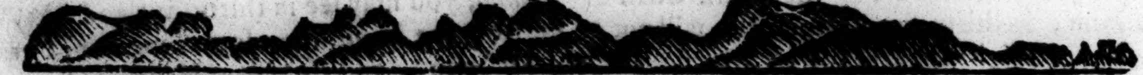
This Iſland lies between the *Shellocks* and the *Dorſeys*, cloſe by the Land.



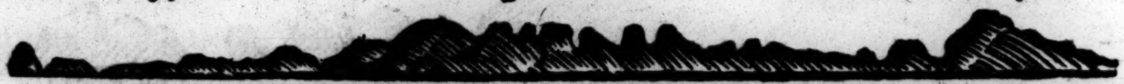
Thus ſhew the *Dorſeys* with the Rocks, *Bull*, *Cow*, *Calf*, which lie without them, and are to the Southward of you.



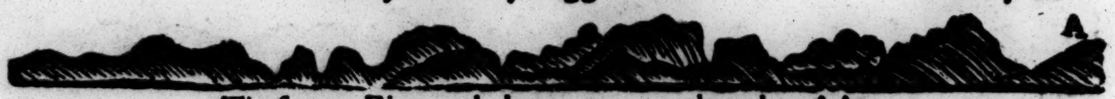
This and the Figure following belong to AA, one to the other.



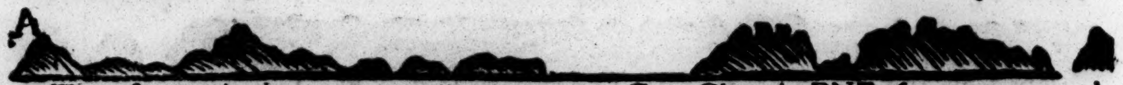
Thus ſhews the *Dorſeys* when you are to the Southward or Eaſtward of them; the E. end at B, ſhews almoſt like *Cape-Clear*, being E from you, but it is a higher Land.



Thus ſhews the Land to the Northward of *Mizen-head* towards the *Dorſeys*, when *Mizen-head*, is NE. by E. 2 Leagues from you, then may you ſee the Iſland of *Cape-Clear* Eaſt from you.

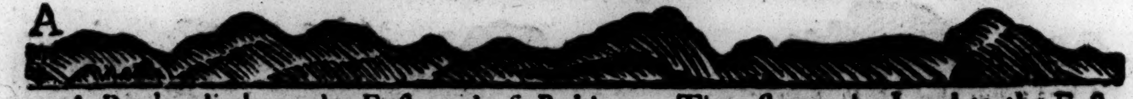

Hilly and very ragged Land.
NE. by E.
A

Theſe two Figures belong one to the other AA.

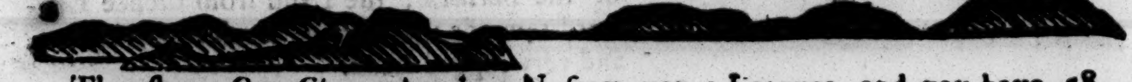

A broad Channel, but within it is all broken Land.
Mizen-head.
ENE. Cape Clear.
A

Thus ſhews the Land on the *Dorſeys*, when *Cape-Clear* is ENE. from you, and *Mizen-head* NE. by E. from you.

The Form of *Cape-Clear*, with the Rock *Foſtney*.

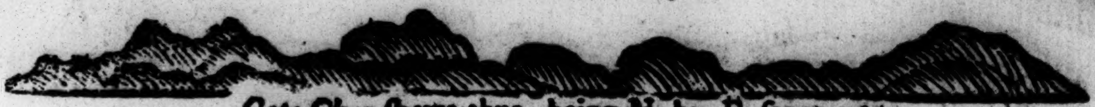


A Rock a little to the Eaſtward of *Baltimore*. Thus ſhews the Land to the Eaſtward of *Baltimore*, as is repreſented by the two foregoing Figures.

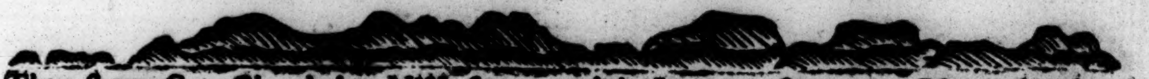


Thus ſhews *Cape Clear* when it is N. from you 5 Leagues, and you have 58 Fathom Water.

Cape-



Cape Clear ſhews thus, being N. by E. from you.

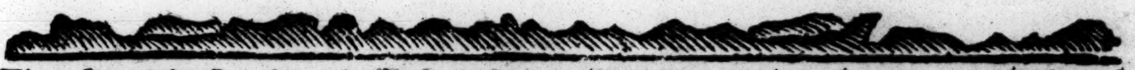


Thus ſhews *Cape Clear* being NW. ſeven or eight Leagues from you. If you then bear N. you ſhall fall right with Old-head; and when you come near the Shore, you ſhall loſe ſight of the High-land, and it ſhall ſeem to be all Low-land.

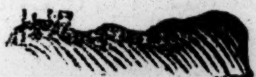
Land within. Land within. Land within.

This follows the former Figure: The eaſtermoſt Hommocks at A, are the high Hills about *Youghall*, which you can hardly ſee, *Cape Clear*, NW. from you ſeven or eight Leagues, they lie far within Land, and the Clouds oftentimes hang over them.

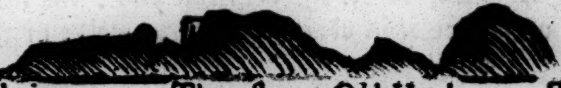
Cape Clear. *Old Head*. Point of *Cork* within the Iſland. Hill within *Youghall*.



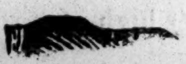
Thus ſhews the Land to the Eaſtward unto *Cape Clear*, and the Land to the Eaſtward of *Old Head*, when you are before *Old Head* two Leagues from the Shore.



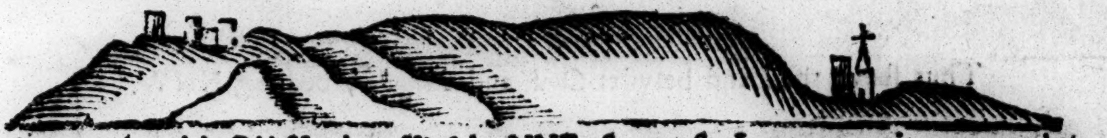
Thus ſhews *Old Head*, being WSW. half a League from you, then you may ſee the Haven of *Kinſale* open.



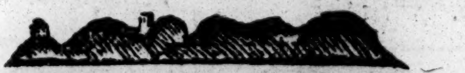
Thus ſhews *Old Head* when it is Weſt two Leagues from you.



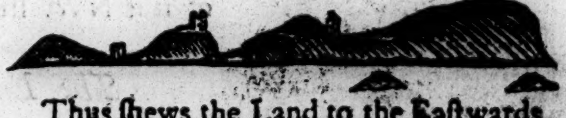
Thus ſhews the Point of the *Roſs*, being W. by N. from you.



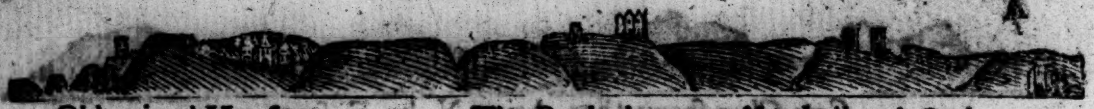
And to run in with *Old Head* on *Kinſale*, NNE. five or ſix Leagues on it appears thus, with a white Clift a little Diſtance to the Eaſtwards of the Head; it is very remarkable both for knowing the Land, and for finding the Harbour's Mouth which lies about two Miles to the Eaſtward of the ſaid Head, luffing up cloſe with the Wind Weſterly, you will ſee the Citadel open, ſhewing white, &c. The *Old Head* is known by having three Towers on it, and an Old ruin'd Caſtle. *Old Head* SW. by W. and the Eaſtern Point, going into the Harbour, NE. by E. you may anchor in twenty two Fathom ſandy Ground.



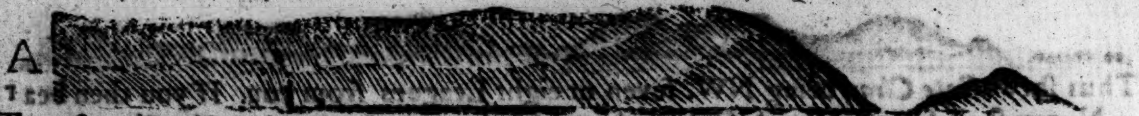
Thus ſhews the Land a little to the Eaſtwards of *Kinſale*.



Thus ſhews the Land to the Eaſtwards of *Cork* toward *Youghall*.

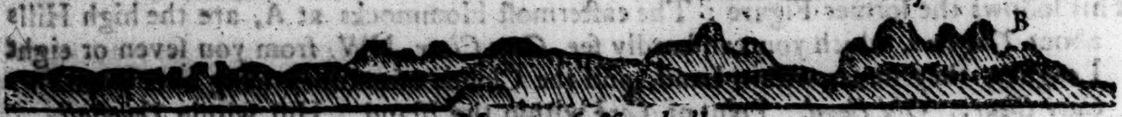


Old ruined Houſes The Rocks between *Youghall* and *Cork.*



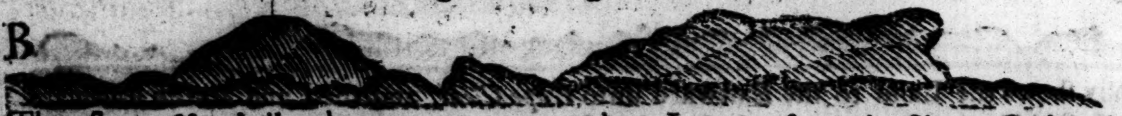
Thus ſhews the Land, when you are to the Eaſtward of *Cork*, not far from the Shore, and that the Harbour's Mouth doth begin to open, as is deſcribed by theſe two Figures: Being near the Shore, it ſeems high Land; but being far off, when you can ſee the high inner Land within *Youghall*, over the Cliff, it ſeems to be but low.

Inner Land N. by W.

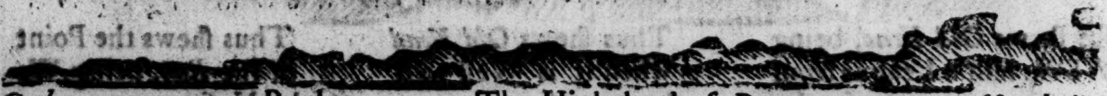


Mount of *Youghall.*

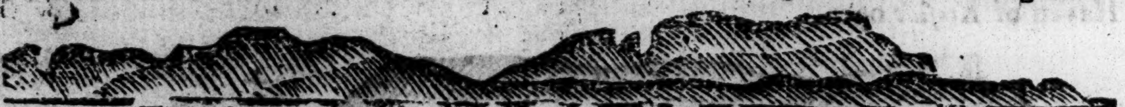
Theſe two Figures belong to each other at BB.



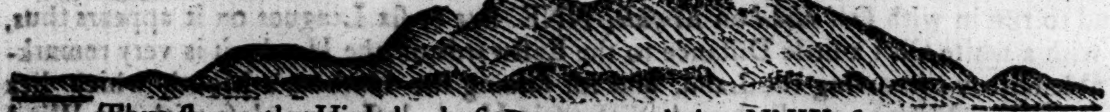
Thus ſhews *Youghall*, when you are two or three Leagues from the Shore, ſo that the high Mountains of *Cape Quin*, be N. by W. from you; the inner double blue Land is very high, for you may ſee it in clear Weather, twelve or thirteen Leagues off.



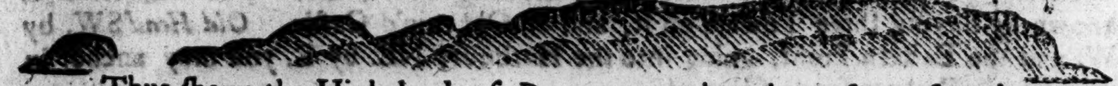
Cork. Rock. The High-land of *Dungarvon.* *Youghall.*



Thus ſhews the Land betwixt *Cork* and *Youghal*, bearing NNW.



Thus ſhews the High-land of *Dungarvon*, being NNW. from you.



Thus ſhews the High-land of *Dungarvon*, when the weſtermoſt end of it is NW. from you.

The End.

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A Table shewing how many Miles answer to a degree of Longitude in every Lattd

D. L	Miles	D. L	Miles	D. L	Miles	D. L	Miles	D. L	Miles
1	59.99	21	56. 1	41	45.28	61	29. 9	81	~~10.42~~ 9.38
2	59.97	22	55.63	42	44.95	62	28.17	82	8.35
3	59.92	23	55.23	43	43.88	63	27.24	83	7.32
4	59.86	24	54.81	44	43.16	64	26.30	84	6.28
5	59.77	25	54.38	45	42.43	65	25.36	85	5.23
6	59.67	26	53.93	46	41.68	66	24.41	86	4.18
7	59.56	27	53.46	47	40.92	67	23.45	87	3.14
8	59.42	28	52.97	48	41.15	68	22.48	88	2. 9
9	59.26	29	52.47	49	39.36	69	21.50	89	1. 5
10	59.08	30	51.96	50	38.57	70	20.52	90	0. 0
11	58.89	31	51.43	51	37.76	71	19.54		
12	58.68	32	50.88	52	36.94	72	18.55		
13	58.46	33	50.32	53	36.11	73	17.54		
14	58.22	34	49.74	54	35.26	74	16.53		
15	57.95	35	49.15	55	34.41	75	15.52		
16	57.67	36	48.54	56	33.55	76	14.51		
17	57.37	37	47.92	57	32.68	77	13.50		
18	57. 6	38	47.28	58	31.79	78	12.48		
19	56.73	39	46.62	59	30.90	79	11.45		
20	56.38	40	45.95	60	30. ~	80	10.42		

Finis

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